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NOTES AND COMMENTS.

Sir Joseph Lister's Address.

THE Presidential Address delivered by Sir Joseph Lister before the British Association, was eminently uncontroversial in character, and does not demand any detailed comment in these columns. Speaking as an exponent of the healing art to an assembly which excludes medicine and surgery from its discussions, he confined his attention to a quiet review of some of the more striking benefits which these arts have received from pure science. The increasing interdependence of science and medical and surgical practice is indeed a fruitful theme for retrospect to one who has played so considerable a part in the development of modern surgery, and Sir Joseph was at no loss for matter for his discourse. He touched, naturally enough, upon those subjects in particular with which he has, in the past, been more specially concerned. After some passing remarks on Röntgen rays and anæsthetics, he devoted the bulk of his address to the applications of bacteriology to medicine in general and surgery in particular. No portion of the address will have been listened to with more interest than that dealing with the development of antiseptic surgery, but such is the modesty of its chief pioneer, that no one who cannot read between the lines would gather, from his words, how great was the part Lister played in its inception and perfection. It is probable that there has never been a practical application of a scientific principle which has so directly saved human life as this. Not merely has the mortality from wounds and operations been enormously reduced, and the terrible results of wound infections become chiefly a matter of history, but operations which were before undreamed of have become almost commonplace owing to the security given by Listerian methods. Sir Joseph eagerly ascribed to Pasteur the foundations upon which antiseptic surgery has been built, and to those other bacteriologists, especially Koch, who have done so much to increase our knowledge of wound infections and their intimate causes, he dealt a full meed of credit. He touched also on the work of

Pasteur, Behring, and others in preventive and curative inoculation, and had a word in season on the matter of vaccination. In conclusion, he spoke of Metschnikoff's work on phagocytosis in terms of acceptance with which some may not wholly agree. The share in producing immunity which the phagocytic powers of leucocytes seem to bear, may be, and possibly is, very considerable; but that it is the main defensive means possessed by the body against micro-organisms is certainly still open to question. Be that as it may, the debt which modern medicine and surgery owe to science is very clearly brought out by Sir Joseph's quiet and dispassionate survey in his Presidential Address.

The Old and the New Physiology.

The interesting and suggestive address given last January by Professor Burdon Sanderson at the Royal Institution on "Ludwig and Modern Physiology," affords much food for reflection. Its main theme is the immense and continuous progress which physiology has made since it has been pursued on strictly experimental lines from a frankly physico-chemical standpoint. To Ludwig more than to any other man, as Professor Sanderson shows, is physiology indebted from its modern foundations, aims, and methods; and this, not only for the clearness and definiteness of his own aims and his own brilliant powers as an experimentalist, but also from the intense and unselfish personal influence which he exercised over his pupils, and which has made the Leipzig School famous throughout the world. It was Ludwig who gave the death blow to the old "vitalist" doctrines which had previously animated physiology, and the vagueness of which had proved so unfruitful in results. The sketch of Ludwig's career and life-work serves Professor Sanderson as the text for some instructive remarks on "The Old Vitalism and the New." It is evident that he is not much in sympathy with the so-called "new vitalism" of Bunge, Driesch, and others, though he extends towards it some degree of tolerance because it does not interfere with the strictly experimental methods which have hitherto proved so admirable in their results. Yet no one who has read Professor Bunge's fascinating book on Physiological and Pathological Chemistry can fail to have been impressed by the case which he makes out for something above and beyond the ordinary known physico-chemical laws of inorganic nature for the interpretation of even such simple vital phenomena as are presented by unicellular organisms, and of which he instances the power of food-selection shown by *Vampyrella*, and the extraordinary capacity shown by *Arcella* for righting itself, when upset, by the spontaneous local development of gas bubbles in its protoplasm. To suppose that such facts are to be explained by postulating a "vital force," is to commit the error of the old "pre-scientific" physiology. But the proof of the existence in the living cell of a force or forces

above and beyond those which reign in the inorganic world—the definition and measurement of such forces, so as to bring them within the range of experiment—these are tasks which may await the physiologists of the future. Professor Sanderson does not, it is true, take too hopeful a view as to the likelihood of such discoveries. Yet following on the lines along which physiology has already progressed so far, when all that is explicable by known physical and chemical law has been explained, the as yet unknown and undefined "vital forces," if such exist, will stand out the more clearly, and present a more definite front for attack from the experimental side.

Experimental Psychology.

A yet newer form of science is experimental psychology. The wonderful energy with which the American Universities have taken it up bears fruit in many interesting records of laboratory work, published in the *American Journal of Psychology*, or the *Psychological Review*, or independently. The Yale Psychological Laboratory, which is under the direction of Dr. E. W. Scripture, has published the record of its third year of work. If the output seems small, it must be remembered how much time has to be spent in organising a new laboratory and in providing apparatus. Among the new apparatus described is a very simple instrument for testing colour-blindness and also for detecting colour-weakness. It depends on the use of different intensities of light: a simple arrangement resembling that of an ophthalmoscope allows red, green, and grey to be seen together in different shades, the colours being looked at through three windows fitted with grey glasses of different darkness. There are two principal researches in the volume. The first, by Dr. Seashore, is an interesting study of "illusions and hallucinations in normal life." He traces the influence of the size of objects on our judgment of weight, larger objects of the same weight being over-estimated, and smaller ones under-estimated. Noteworthy is the persistence of the illusion in spite of practice. In a second set of experiments Dr. Seashore found that it was possible by exciting expectation to produce hallucinations of various kinds in the absence of any physical stimulation. Sometimes there was a direct suggestion, sometimes the repetition of the stimulus a sufficien number of times led the patient to imagine it when it was absent. Thus hallucinations were produced of warmth, of a least perceptible difference of two lights, of a change in the intensity of illumination, even of actual objects. This investigation, though not surprising, is of some importance in itself, and as indicating a source of error in psychophysical experiments. Dr. Moore has a study of how fatigue affects the accommodation of an eye that is endeavouring to locate a point half way between two others on the line of sight. The error grows immensely with fatigue, though less with the single eye than with the two eyes. Some experiments are also recorded by

Mr. Weyer designed to discover the reaction-time of a dog; this was found to be ·089 seconds for an electrical shock to the forepaw, which reacted by withdrawal. Attempts were made also at determining the time of discrimination, but over and above the difficulty of apparatus, it is plain enough that such experiments, interesting as they are, are of doubtful value through the absence of introspection on the part of the subject.

THE PSYCHOLOGY OF THE CHILD.

THE recent deliverances of Professor E. D. Cope on the subject of consciousness and evolution have naturally attracted the attention of psychologists as well as biologists. At the meeting of the American Psychological Association at Philadelphia, in December of last year, he expounded the view (now easily accessible in his recent "Factors of Organic Evolution") of consciousness as a special factor in evolution, and as having been present from the beginning. The May number of the *Psychological Review* contains some remarks by Professor J. M. Baldwin on Dr. Cope's address and on one by Professor William James which followed it, which are well worth attention. In particular Mr. Baldwin indicates very clearly the error into which Mr. James at least seems to fall, of supposing that those who have recourse to brain-processes for their explanation of mental events deny the causality of consciousness itself—though, doubtless, this denial is implied in the epi-phenomenon theory of consciousness. The chief point, however, of Mr. Baldwin's paper is to plead for an ontogenetic study of the human mind in the mind of the child. He urges that to recognise consciousness as a factor in evolution is rather against than for the Neo-Lamarckian theory of heredity, having regard to the large part which consciousness plays in the child's life, and its relatively small endowment of natural heredity. And he points out how, from a psychological study of childhood, he has been led to promulgate a theory of organic selection, as he calls it, which represents a factor overlooked in current theories. This theory, which is expounded in his "Mental Evolution in Man and in the Race," holds that pleasant stimulations lead to reactions which tend to retain the stimulation, and so to repeat themselves by a kind of circular reaction, and that this form of reaction while it "represents habit, since it tends to keep up old movements," also "secures new adaptations, since it provides for the overproduction of movement-variations for the operation of selection."

A DICTIONARY OF PHILOSOPHY AND PSYCHOLOGY.

AN enterprise of much importance for psychology and philosophy is announced by Messrs. Macmillan in the shape of a dictionary with the above title, to be edited by the indefatigable Professor Baldwin. It is to contain definitions of terms used in the philosophical sciences,

with historical matter to justify the definition, and with bibliographical references. Intended, as it is, not only to fix the very unsettled usage of terms, but also to serve as an introduction to the various philosophical departments, it will apparently treat its subject with a liberal hand. There can be no doubt of the usefulness of such a book if well executed, and certainly the publishers have secured a goodly array of contributors, mentioned in the preliminary announcement, who are an excellent guarantee of success.

Natural Science at Cambridge.

The thirtieth annual Report of the Museums and Lecture Rooms Syndicate, Cambridge, for 1895 has been received. We have already noticed some of the additions to the Museum of Zoology, and we may now add a series of over three hundred unnamed specimens of Bryozoa given by Miss E. C. Jelly, preparations of Mycetozoa presented by Messrs. A. & J. J. Lister, and over one hundred sections of recent and fossil plants from the collection of the late Professor W. C. Williamson. The arrangement and naming of the general Herbarium is progressing, with the assistance of numerous specialists, among whom may be mentioned Mr. F. Crepin who has named 1,500 sheets of roses, and published a paper upon them in the *Journal of Botany*. The number of students attending lectures in botany appears to be considerable if we may judge from the fact that 76 attended Mr. Seward's lectures in the Michaelmas term, 1895, while 89 attended those of Professor Ward in Lent term, 1896. Most of these are of course elementary students, who, by the way, are so numerous that accommodation cannot be found for them in the proper laboratory, and they have to overflow into the museum. The elementary biology class in the zoological laboratory reached the huge number of 174 during Easter term, 1895, but the advanced zoology class did not exceed twelve.

The most important addition to the physiological department during the past year is the new animal house, in which animals can be kept under proper conditions all the year round. It is satisfactory to find that seven persons, in addition to the staff, have been doing research work in the laboratory during the year.

The number of students working at the geological museum has been 125. The Professor of Geology reports:—"We are again indebted . . . for very valuable gifts to the University, namely, a collection of Devonian Fossils, figured and described . . . in the Monographs of the Palæontographical Society, and of a number of Brachiopods, figured and described by Davidson in his Monograph on the group." No doubt the donor has a very proper affection for his old university, but considering that Davidson's collection has been bequeathed to the British Museum, and that an attempt has been made to place together there all the specimens figured in his Monograph it seems to us

rather regrettable that these Devonian Brachiopods should have been sent to another collection. We have also noticed in the Monograph on Devonian Fossils above alluded to very numerous acknowledgments of the "great kindness" and "very kind help" received by the author from most of the assistants in the Geological Department in the British Museum. Doubtless the gentlemen in question are only too delighted to aid so enthusiastic a worker, but the public and the Trustees may well ask where the gain is to their Museum.

GRAPTOLITES.

CAMBRIDGE geologists, following the lead of Mr. J. E. Marr, are paying much attention to graptolites, and it gives us pleasure to present them and our other readers with the article on the structure of those animals contained in this and the previous number. The views of Gerhard Holm have been fully placed before English palæontologists by the translations of his papers that have appeared in the *Geological Magazine*, whereas the slightly different opinions and important results of Wiman, with the exception of quite a short review in the *Geological Magazine* for September, 1895, have not received any exposition in the English language. The observations of this Scandinavian author, as well as of those quoted in Dr. Wiman's paper, refer to the morphology of the graptolites; but our readers are not likely to forget that these animals are of even greater importance in their geological aspect, and of the recent results in this direction a concise account was given in *Science Progress* for July of this year by Mr. Marr, whose own applications of these fossils to the correlation of strata have not been among the least important.

For the correlation of strata it is naturally most necessary that the determination of the species should be exact. "More harm," says Mr. Marr, "is done by a wrong determination than good by a correct one. The graptolites are by no means easy of identification by those who have not made them a special study, and it is particularly desirable that no determination should be recorded by tyros, unless it is absolutely certain, for when once a wrong name has crept into a list it is exceedingly difficult to remove it." These remarks are quite as applicable to other fossils as to graptolites, and may well be commended to the notice of the hard-working gentlemen who draw up the ponderous lists of fossils published in the *Memoirs* of the Geological Survey. It is now generally supposed that the deposits in which graptolites are found were deposited in deep waters at some distance from continents, since graptolites are often found in association with animals of a deep-sea habit, and especially with tests of Radiolaria. This, however, as Mr. Marr appears, though not very clearly, to suggest, is not due to the absence of graptolites from rocks of very different character deposited close to land, such as the coral-reef rocks of Gotland, but merely to the fact that deposition was so slow in

these deep-sea deposits that the proportion of these ubiquitous organisms to the cubic foot was naturally greater. Mr. Marr gives a useful list of the graptolitic zones, with special reference to the rocks of England, and suggests that the absence of graptolites from deposits lithologically similar to those in which they are present, "is most readily explicable by climatic change." The article ends with a word in favour of fossils. From recent organisms the biologist has been able to ascertain that evolution occurs; but how it occurs is left for the palæontologist with his long series of species to describe. That the study of graptolites has not been in vain is proved by the best of all tests, namely, that the palæontologist in his workroom has been able to predict the existence of forms which were subsequently discovered by the geologist in the field.

Fossils.

The Palæontographical Society celebrated its jubilee last July, and an account of its rise and progress appears in the September number of the *Geological Magazine*. This is accompanied by the reproduction of a photograph taken in 1856 of four of the early geologists who interested themselves in the movement: Professor Morris, Professor Prestwich, Mr. Searles Wood, senior, and Mr. F. E. Edwards.

The officers of this society for the ensuing year are: President, Dr. Henry Woodward, he being succeeded as a Vice-President by Rev. G. F. Whidborne; Treasurer, Mr. R. Etheridge, F.R.S.; Secretary, Rev. T. Wiltshire; Council, Dr. W. T. Blanford, Rev. T. G. Bonney, Rev. R. A. Bullen, Rev. A. Fuller, Dr. J. Harley, Dr. H. Hicks, Dr. Wheelton Hind, Mr. J. Hopkinson, Professor E. Hull, Professor Rupert Jones, Mr. J. E. Marr, Dr. J. S. Phené, Mr. W. P. Sladen, Mr. B. Woodd Smith, and Mr. H. Woods. And yet, as a recent writer in *Nature* complains, "the geologists, zoologists, and botanists of the British Islands regard palæontology as an inferior science"; surely not, when it can be represented by such "potent, grave, and Reverend seniors"! By the way, is it strictly and scientifically accurate to say, in the words of the interesting account above alluded to, that "the officers cheerfully *give* their services"?

It is a curious fact that, of the eighty-seven writers who during the past ten years have published original work in British Palæontology, only twenty-five are members of this society, while most of the best-known names are conspicuously and lamentably absent. To induce these renegades to join the ranks of the faithful, our contemporary publishes a little computation of the average number of pages and illustrations published each year, with the average number of species described. The result is "far and away beyond what has yet been accomplished by any Continental Palæontographical Society for a subscription of one guinea annually." No one will deny the quantity, but what about

the quality? Few wish better to this hardworking and jubilant society than we do, in proof whereof we present them with a key to their perplexities in the reminder that palæontography is not always palæontology.

Wanted—A Lecture Theatre.

The Swiney Lectures, under the auspices of the Trustees of the British Museum, are this year to be delivered by Dr. R. H. Traquair, who has announced for his subject "The Geological History of Vertebrate Animals."

The lectures will be given at 5 p.m. on the Mondays, Wednesdays and Fridays of October, beginning on October 5, in the lecture theatre at the South Kensington Museum of Science and Art, since the Natural History Museum, with which they are connected and whose specimens they are supposed to illustrate, is still without that much-needed addition. Such a convenience is more needed at this museum than at most, for, as is well known, no specimens can be removed from its walls for the illustration of any lectures or demonstrations whatever. What a contrast is, say, the Hamburg Museum, which has an excellently constructed theatre, in which courses of lectures on all manner of scientific subjects are given right through the winter months! The curators of this museum take their share in lecturing, and endeavour to co-operate with the various educational institutions and learned bodies of the town. Can anyone suppose that the museum loses by this?

With us, however, the vast treasures of a national institution remain a closed book to those who support them, while the authorities of many of our local museums recognise their educational duties and, by free lectures, instruct the public in their own property. At Manchester, for instance, lectures commence on October 24 with the geological history of the district round Manchester, by Professor Boyd Dawkins, and are continued by Professor Hickson, November 14, on the inhabitants of the seas; by Professor Weiss, January 16, on economic botany; by Dr. Burghardt, February 6, on soils, their nature and origin, and by Mr. Hoyle, Boxing Day, Easter and Whit Mondays, on birds.

Fruits of Travel.

The results of the travels of Dr. Forsyth Major and Mr. Alphonse Robert, during the past twenty-two months in Madagascar, have been most interesting and important from a zoological point of view. The districts traversed were Imerina, Betsileo and Tanala. Work in the swamps can only be done at most for three months in the year, so it was not possible to do much systematic digging. The travellers were, however, rewarded by a fine series of *Æpyornis* remains, which comprised all the important parts of the skeleton and several skulls,

ERRATUM on p. 226 of this number:—

for "another species of this genus," *read* "another species of *Phororhacos* to that figured in NATURAL SCIENCE, vol. viii., p. 296."

besides some remarkable remains of extinct Mammalia, the descriptions of which will, we hope, be made public immediately. No less than twenty new forms of Rodentia and Insectivora were secured, one of the most singular being a web-footed form of the family Centetidæ. Small collections of land Invertebrata were made, and a large series of plants, which latter includes several new orchids.

The collections made during the Conway Expedition to Spitzbergen have also arrived in London. These include a fairly complete series illustrating the natural history of the island. Mr. Battye obtained skins of most of the species of birds found on the island. Mr. E. J. Garwood and Dr. Gregory, who worked together on the geology, obtained collections from all the known fossiliferous horizons ranging from the Devonian to the Pleistocene. The latter also brought back a collection of plants from the interior, and a general zoological collection. For further remarks on this subject we refer our readers to Dr. Gregory's article in this number on the "Arctic Work of 1896."

Extinct Birds.

The collections of Dr. Forsyth Major above referred to have thrown considerable light on the structure of the skeleton of *Æpyornis*, the extinct struthious bird of Madagascar, long known only from a few leg-bones and vertebræ. In a paper, descriptive of the new specimens, lately published in the *Ibis* (July 1896), Mr. C. W. Andrews has figured the skull, sternum, and shoulder-girdle for the first time. The skull seems in many respects to resemble that of some of the Dinornithidæ, though it is much less depressed; one very interesting point is the presence on the frontals of numerous deep pits which seem to indicate that in the living bird the head was ornamented with a crest of large feathers. The sternum is a very remarkable structure, being extremely broad in proportion to its length; it is said to resemble most nearly that of *Apteryx*, but to have undergone still further reduction. In the shoulder girdle, the coracoid and scapula form a very open angle with one another and are co-ossified as in the other Ratitæ. In this portion of the skeleton *Æpyornis* appears to approach the cassowary, with which, moreover, numerous other points of resemblance have been pointed out by Milne Edwards and Grandidier. The author also describes some small bones which he regards as humeri; if this determination is correct, the wing would appear to have undergone a somewhat greater reduction in proportion to the size of the bird than in the cassowary. The numerous points of similarity between the Æpyornithidæ, Casuariidæ, and Dinornithidæ are of much interest from the point of view of geographical distribution, but whether they necessarily indicate a former southern land connection between the areas inhabited by these birds, or can be explained as the result of

descent from a common ancestor in the northern hemisphere, is a question on which widely divergent views are held.

In *Novitates Zoologicæ* for March, in a paper on *Diaphorapteryx Hawkinsi*, the extinct flightless rail of the Chatham Islands, Andrews has touched upon the question of a southern land connection between the New Zealand and Mascarene areas. It will be remembered that Forbes attached great importance to the occurrence of *Aphanapteryx*-like rails in these two widely separated regions, but it appears that this phenomenon may be accounted for by supposing that they have originated independently in the two groups of islands from rails which gradually lost their power of flight as a direct result of their insular habitat; or in other words these flightless rails "are of no value in determining former geographical conditions, since they are themselves the outcome of the present one."

In a recent paper (*Annales des Sciences Naturelles* (Zoologie), ser. viii., tom. ii., 1896, p. 117) on the extinct birds of the Chatham Islands, Milne Edwards arrives at different conclusions, and is strongly in favour of a southern land-connection, adducing in support of his opinion the similarity between the Ratitæ of the several regions. He, however, asserts that these Ratitæ have probably originated from flightless rails of a type represented in recent times by *Ocydromus*, *Aphanapteryx*, *Diaphorapteryx*, etc. But if this is the case, there seems to be no reason why these ratite birds, like the flightless rails, may not have arisen quite independently in the several regions, their similarity likewise merely resulting from the possession of similar ancestors and from parallelism of development.

A photographic figure of a nearly complete articulated skeleton of *Diaphorapteryx Hawkinsi* was published in the *Geological Magazine* for August, 1896, and though too small to be of any value in matters of detail, it gives a very fair idea of the general proportions and appearance of this remarkable rail. A restoration of a huge skull of another species of this genus, by Mr. W. Barlow, was exhibited at the meeting of the British Association.

A Reconstructed Moa Skeleton.

The Annual Report on the Museum of the Royal College of Surgeons of England contains a rather strange flourish about a "magnificent specimen of the gigantic extinct bird the Moa (*Dinornis maximus*), from the South Island, New Zealand," recently purchased through the kind services of "Mr. Hutton, of Canterbury, N.Z." "The bones did not," says the Report rather disappointingly, "belong to one bird, but they have all been carefully matched as regards size, and the few not present have been supplied by accurate casts made from real bones. This skeleton," continues the Report, resuming its triumphant tone, "is especially interesting as possessing

both coraco-scapulars and both big toes [? hind toes]: neither of these are present in the specimen displayed in the British Museum."

Captain F. W. Hutton, of Christchurch—if he be the Mr. Hutton intended—has such an intimate knowledge of the *Dinornis* skeleton, and is himself so stern a rejector of "faked up" specimens, that we are quite sure the restoration in question is an accurate one, as admirably adapted to the needs of the science student as to those of the British public. But there is nothing so "noticeable" or "especially interesting" in the fact that a restoration is a complete one; the British Museum, probably, is quite as rich in coraco-scapulas and hind toes of Moas as even the Museum at Canterbury College, Christchurch, and, even without plaster's artful aid, could produce restorations of more than one species, the scientific value of which would diminish in proportion as their popular attractiveness increased.

We deprecate the idea, unconsciously suggested in the paragraph from which we have quoted, that there is any rivalry between two such institutions as the Museum in Lincoln's Inn Fields and that in Cromwell Road; but the paragraph has produced a false impression on writers for the public press, which those in possession of the facts feel it their duty to correct. No great harm, however, would be done, if the labels attached to such exhibits always stated, as clearly as does the Report, how these specimens had been composed. This, we fear, is not always the case, even at the British Museum. Still, here is a chance for the Geological Department to go one better: why should not Dr. Henry Woodward, with the capable assistance of Mr. C. W. Andrews, Mr. W. Barlow, and Mr. Pickhardt, reconstruct a *Dinornis maximus*, not as a naked skeleton, but in his habit as he lived? So many remains of the integument and feathers of these huge birds are now known, that the restoration not only is possible, but might actually be probable.

Sponges.

One of the most recent additions to the exhibited collections of the British Museum (Nat. Hist.) is a case in the "Index Museum," containing a series of specimens, diagrams, and labels, illustrating the nature of sponges. The object of the series is to set forth the simpler features of sponge structure, such as the fact that sponges are animals in which currents of water enter and leave the body, after traversing a more or less complicated system of canals, and that this body is supported by a skeleton. The sponge is regarded as an organism with two layers, viz., (1) the collar cells, lining part of the canal system, and (2) the "derm," forming the bulk of the sponge body, and including the metabolic, skeletal, and reproductive elements. The epithelium which covers the outer surface, and which lines the canal surfaces not clothed with collar cells, is considered to be merely a layer of modified derm cells, and not a special ectoderm layer. At the same time, it is suggested that the flat epithelial cells

lining the "out-current" canals may, in some sponges, be altered collar cells. Fortunately, not much space is devoted to these controversial questions, which, after all, from the point of view of the exhibited series, are only of academic interest.

The series begins with a definition of sponges. Then follows the description of a simple Ascon sponge belonging to the "Olynthus" type, *i.e.*, consisting of a simple thin-walled sac, opening at the top by the ascule, and with the thin wall perforated by pores. Five tiny specimens resembling little tags of white thread are exhibited, and by the side of them explanatory water-colour drawings. Next follows a short account of the canal systems, which, after the scheme of Vosmaer, are grouped under four types, ascending from the simplest to the next highly evolved.

A series explanatory of the classification, which is based on the nature of the skeleton, follows. The group is divided into two classes, Calcarea and Silicea; the Silicea are divided into two sub-classes, Hexactinellida and Demospongiæ; and the latter sub-class is divided into four orders, Tetractinellida, Carnosa, Monaxonida, and Keratosa. The various divisions are illustrated by typical specimens and diagrams.

The results of Professor Dendy have chiefly been drawn upon for describing the Calcarea, those of Professor F. E. Schulze for the Hexactinellida and Keratosa, and those of Professor Sollas for the Tetractinellida. The illustrations of the Monaxonida are mainly original. Comparatively full descriptions have been given of the Venus' Flower-basket, the Glass-Rope Sponge, the Crumb-of-Bread Sponge, and the Fine and Common Bath Sponges. A very interesting column is devoted to the Freshwater and Boring Sponges.

Evidently the greatest care has been taken to render the labels concise, and, at the same time intelligible. To this end several changes are introduced into the nomenclature: for instance, "whip-chambers" (Geissel-kammern) for "flagellated chambers"; "in-current" and "out-current" for inhalant, exhalant, excurrent; "derm" for the confusing expressions ecto-meso- or meso-ecto-derm. The design of the whole series, and the manner of mounting and arranging the specimens is very satisfactory, and the result does credit to Mr. R. Kirkpatrick.

Anders Retzius.

On October 13 the centenary of the birth of the zoologist and anthropologist, Anders Retzius, is to be celebrated in Stockholm, and his son, Professor Gustaf Retzius, hopes, by that time, to have completed the great work on the human brain, that has occupied his energies for the last nine years.

The Retzius family has had among its members so many naturalists of eminence, that, to prevent confusion, we may recall

some of the work done by this particular Anders Retzius, who is not to be confused with his father, Anders Johan, or with Anders Adolf. He published, for the most part in Swedish, several minor studies in comparative anatomy, confining himself chiefly, though not entirely, to the Vertebrata. Among these were the important "Microscopical Researches on the Teeth," published in the *Handlingar* of the Swedish Academy for 1836. His main work, however, was done in craniology, where his writings, if not very numerous, were most suggestive. Thus, it is to him that we owe the terms brachycephaly and dolichocephaly, and the formulation of the cranial index. It is interesting to note that precisely fifty years have elapsed since the British Association published his paper "On the ethnographical distribution of round and elongated crania," and it was, therefore, appropriate that this jubilee, as well as the centenary, should have been celebrated at Liverpool by the Anthropological Section of the Association, on September 18, as well as pleasing that the genial Professor Retzius of to-day should have been present to receive the congratulations.

Librarians on Dewey.

The Library Association of the United Kingdom met at Buxton during the first week of September and, among other things, discussed the Dewey decimal classification. Our correspondent writes: "It was very noticeable that everyone who had tried the system was in favour of it. The criticisms of the opponents either were directed against all schemes of classification, and not against Dewey in particular, or else showed entire misconception of the principles and practice of Dewey. We had the time-honoured objections that certain books belong to two classes; that the press-marks became too long, etc., etc., as well as the confusion between classification on the shelves and classification in the catalogue. However, there were a large number present who had tried the system and spoke warmly of it from long personal experience; and this, after all, is the main thing."

The Flora of the Alps.

The recent issue of the Linnean Society's *Transactions* (vol. v., pp. 119–227) contains a valuable contribution to plant-geography in general and alpine botany in particular. In a lecture at the Royal Geographical Society in 1879, on the origin of the flora of the European Alps, the late John Ball told how a passion for mountain scenery had led him from youth onwards to pass much of his time in the Alps, and to visit, among other mountain districts, the Carpathians, the Pyrenees, the mountains of Southern Spain, and the hills of our own islands. "It was impossible to collect the plants of all these districts without being struck at once by the resemblances and the contrasts presented by their respective floras, and without being led

to endeavour to account for them." Selecting the southern side of the main chain of the Alps as having the richest and most varied flora, he divided it into fifty districts, and set himself to collect materials from published works and herbaria, but chiefly from his own repeated visits. For nearly thirty years he worked at the collection and tabulation of the plants of these fifty districts, and their distribution on other European mountains. Unfortunately, at his death, in 1889, the work was still incomplete, and for his conclusions from all this mass of material, we are entirely dependent on his lecture at the Geographical Society of ten years before. Mr. Thistleton Dyer undertook the editing of the table, which occupies one hundred pages of the Linnean Society's *Transactions*, and will be a valuable basis for further work. Without doubt, facts of the highest interest lie buried in its columns, but it will need a skilled botanist, and one who has studied Alpine floras well, to bring them to light. If the entries are treated as mere symbols, misleading or false conclusions will arise. In working in this way with all the plants of a flora, critical and doubtful species will, unless great care be taken, exercise an important influence on statistical results. A safer and simpler method of studying the relations of the local floras of large areas is the one recommended by Mr. C. B. Clarke in an address to the Linnean Society, to which we referred in NATURAL SCIENCE (vol. viii., p. 366, June, 1896). It is the selection of a limited number of common and unmistakeable plants, and a careful elaboration of their distribution and habitat.

According to Mr. Ball the Alps, as a whole, contain 2,010 species of flowering plants, representing 523 genera and 96 natural orders. Compared with the floras of other regions, a large proportion of the species, more than two-fifths, are found in all parts of temperate Europe, the majority extending to Siberia, and many even to North America. "These are clearly plants that have a considerable power of adapting themselves to varied physical conditions, and whose vigorous organisation has made them victorious in the struggle for existence." Of these, however, not one in twelve (actually only 65 in 792) can be reckoned as plants of the higher mountain region; most of them are common enough in the lower zone, but grow equally well in the woods and heaths and waste grounds of Middle Europe. Subtracting also some Mediterranean stragglers, we have a special Alpine flora of about 1,150 species. Of these "more than one-seventh are endemic, rather more than half are common to the Alps and the Pyrenees, just two-thirds are common to the Alps and Carpathians, while rather more than one-sixth are common to the Alps and the north of Europe and Asia." Compared with other mountain regions not immediately adjoining, the closest affinity is found to be with the mountains of Northern Asia, notwithstanding the vast interval of space and the great difference in climate. Of every twelve Alpine species, three are to be found in the Altai, but only two in the Caucasus,

a mountain mass with a rich flora and a much more favourable climate. Finally, a comparison between the Alpine and Arctic floras shows that only 17 per cent. of the species of the former are found in the latter, in strong contrast to the 25 per cent. which are common to the Alps and the mountains of Northern Asia. The conclusion to which Mr. Ball was therefore inclined, is that the Alpine flora owes but little to a migration from the North. "What," he says, "should we have to say of the remaining 83 per cent., including at least four generic types peculiar to the Alps, and a very large number not found in the Arctic regions?" "Is it credible that in the short interval since the close of the Glacial period, hundreds of very distinct species and several genera have been developed in the Alps, and—what is no less hard to conceive—that several of these non-Arctic species should still more recently have been distributed, at wide intervals, throughout a discontinuous mountain chain some 1,500 miles in length, from the Pyrenees to the Eastern Carpathians?" Many of these non-Arctic types are, moreover, represented in the mountains of distant regions, not by the same but by allied species, which must have had a common ancestor. *Wulfenia*, for instance, has one species in the Alps, another in Northern Syria, while a third allied species has its home in the Himalaya.

The origin of the flora of the European Alps remains an unsolved problem; but towards its solution Mr. Ball's table will, in the right hands, afford considerable help.

Clover Hay.

In commenting on our note of last July (p. 11), "A Danger of Clover," a correspondent of *Farm and Home*, who signs himself "Pateley Bridge," remarks:—"Trifolium hay is not a common article in this country, but when it is made into hay, it is generally owing to a larger area having been sown than is required for green meat, and is usually allowed to stand until no longer fit for this purpose. This makes it pretty old before it is cut for conversion into hay. I have never met with a case of calculi, or, indeed, any worse intestinal trouble than colic, resulting from the excessive consumption of old trifolium in the shape of green meat, and I cannot understand how any accumulation of the hairs can cause 'peritonitis,' as stated in the report; but if the minute hairs which invest the glume of the oat, and which are especially abundant in poor, thin samples, can, when felted together and combined with a portion of earthy matter and inspissated mucus, form large tuberculated concretions, it does not seem unreasonable that the hairs from the calyx of trifolium should be capable of producing similar mischief."

The Iceland Earthquake.

News of a severe earthquake which occurred in Iceland, on August 26 and 27, has been brought by the steamers "Laura"

and "Quiraing." The shocks extended over an area of forty miles in the south of the island, and destroyed many farms and two churches, besides killing a number of sheep and cattle. A slight shock was also felt on September 2. The hot springs in the neighbourhood have assumed the form of small geysers, and the phenomenon is regarded as due to an approaching eruption of Mount Hecla.

Scorpions.

Professor Malcolm Laurie has been examining numerous scorpions with a view to determining the classificatory value of the anatomy and development. His results, published in the August number of the *Annals and Magazine of Natural History*, lead him to be "more than ever convinced of the great value of the mode of development as a basis for classification," and he considers "the structure of the lung-book lamellæ of subordinate but considerable value."

There are two chief types of development among scorpions which Laurie describes as apoikogenic and katoikogenic. The first (ἄποικος, away from home) type, is as a rule abundantly supplied with food-yolk, the egg early leaves the follicle in which it is formed and passes into the cavity of the ovarian tube; the second type (κατοικος, at home), so far as observation has yet gone, is devoid of any appreciable amount of food yolk, while the egg develops *in situ*, and the embryo as it becomes too large for the follicle, extends down and occupies a diverticulum from the ovarian tube, at the distal end of which the egg is originally formed. The author's investigations lead him to believe that the apoikogenic type of development is the most primitive. It is only one step from the laying of the eggs, which is almost the universal custom among the Arthropoda. With regard to the structure of the lung-books, Professor Laurie is inclined to consider the "spinous" type as the original. It is interesting to note that his classification coincides very closely with that proposed by Pocock, which was based on external structures.

Lepidosiren.

Dr. Günther prints in *Nature* (July 23) a letter from Dr. Goeldi, of the Para Museum, announcing the discovery of *Lepidosiren* at the mouth of the River Amazons. The exact locality of the specimen is Fazenda 'Dunas,' on Cape Magoary, Island of Marajó, and it is the third that has been seen in that locality. A brief examination of the specimen led Dr. Goeldi to agree with Dr. Günther and Professor Lankester in considering that there is only one species of the fish, and that *L. dissimilis*, *L. gigliona*, and *L. articulata* are merely synonyms of *L. paradoxa*. Although there are six Amazonian specimens in European museums, this additional discovery is of much interest and importance.

I.

The Arctic Work of 1896.

THE year 1896 will long be memorable in Arctic annals. It opened sadly, hopes for a vigorous effort to explore the Antarctic Continent having been damped by the inability of the British Admiralty to help in the work; and although we have heard of many expeditions, British, Belgium, and German, which were preparing, not one of them has yet started. The disappointment thus occasioned has, however, been completely effaced by the rejoicings over the return of Dr. Nansen and his colleagues of the "Fram."

The story of Nansen's daring march is well known from his graphic narrative published by the *Daily Chronicle* (August 17 and 19), from which, in the main, the following outline has been compiled.

Nansen left Europe in 1893 in order to reach the Pole by floating with the ice-pack from the north of Siberia to the Greenland Sea. It was well known that off the Arctic coast of eastern Siberia the water drifts northward; also that currents flow southward from the Pole down each side of Greenland and along the eastern coast of Spitzbergen. Nansen thought it probable that these movements were all part of one great current, which flowed right across the Pole. Support was given to this idea by two considerations: firstly, the marine fauna of the Greenland coasts is remarkably similar to that of Siberia; secondly, in 1881 the steamer "Jeannette" (better known by its old name of the "Pandora") was crushed by ice to the northwest of the New Siberia Islands (155° E. 77° 15′ N.), and some years later various articles, supposed to be relics of the "Jeannette," were found off Cape Farewell, at the southern end of Greenland. Accepting these two arguments as rendering the existence of the Polar Current most probable, Nansen proposed to get frozen into the pack near the point where the "Jeannette" was nipped, and then float along the same course into the Greenland Sea. The "Fram" was accordingly designed with especial reference to capability of withstanding ice-pressure, and supplied with stores for six years. Nansen left Norway early in 1893, and the last news from him was sent from Jugor Strait, the south-western entrance to the Kara Sea, in August of the same year. It had been arranged that he should pick up a further supply of dogs from the Olonek River, but owing to some delays in rounding Cape Chelyuskin, it was not till September 15 that the

"Fram" reached the estuary of the river. It was then too late to risk an approach to the land, so the ship's head was turned north-eastward for the New Siberia Islands, which were passed on September 18. Here the pack ice compelled the course to be changed to the north-west, and thus the "Fram" was finally frozen into the ice-pack in 78° 50′ N., 133° 37′ E., or about 20° too much to the west.

Thence the expedition floated to the north-west, although the course was apparently irregular, changing with the winds. Up till the point where the "Fram" was beset by the floes, the depth of the sea was only 90 fathoms; but north of this it deepened rapidly, and the depth varied from 1,600 to 2,200 fathoms, until the "Fram" approached shallower water north of Spitzbergen.

All through the winter of 1893 and the spring of 1894 the resultant course of the "Fram" was north-westward; in the summer, the direction was reversed, as the prevailing winds, following the ordinary Arctic rule, were from the north. In the winter of 1894–5 the "Fram" again went northward, crossing the highest previous record of 83° 24′ (attained by Lockwood during the Greely Expedition) on Christmas Eve. In the following month she ran her greatest risk from ice-pressure. She had been designed so that if the lateral ice-pressure exceeded a certain amount the ship should be squeezed upward out of the ice; Mr. Colin Archer's calculations were found to be reliable, and the ship rose above the ice as her skilled designer had expected. On March 3, 1895, the latitude of 84° 4′ was reached, and the "Fram" again drifted southward. Expecting that this would be the highest latitude reached, Nansen and one companion, Lieutenant Johansen, left the ship on a sledging expedition toward the Pole. They took three sledges, two kayaks (Eskimo canoes), twenty-eight dogs, and provisions for themselves for one hundred days. The two explorers started on March 14 from 83° 59′ N. and 102° 27′ E. The ice was almost stationary, and good progress was made to the north. In eight days they advanced 1° 11′ northward; after this, progress was slower, as the ice moved southward—the average up till April 4 being a little over three miles a day. Three days later at latitude 86° 14′, after only another eleven miles had been gained, it was deemed advisable to return. The explorers, however, had travelled 2° 15′ northward in three weeks. On April 8 the return journey toward Franz Josef Land was commenced. On June 4, at latitude 82° 18′ N., the ice began to drift northward, and by June 15 they had been carried 8° further north. A week later they found the first sign of proximity to land, as they shot a seal (*Phoca barbata*), and afterwards at the same place got three bears. As the snow was in bad condition and they now had plenty of food Nansen stayed there for a month. They started again on July 22, and two days later sighted land; this, however, they could not reach until August 6. On August 12 they came to the first large island of the Franz Josef Archipelago, and on August 26 went into winter quarters. They lived in Eskimo

fashion, in a hut of skins, stones, snow, and earth; used blubber for fuel, and fed on blubber and bear meat. On May 19, 1896, they started for Spitzbergen, keeping south-west down a broad, frozen sound, to the open water and small islands to the south of the archipelago. On June 16 they thought they heard dogs barking, and next day heard a shot fired. Johansen stayed with the kayaks while Nansen went off in search and found Jackson's party in their winter quarters: the Norwegian explorers subsequently returned with the "Windward" to Vardö.

While Nansen and Johansen were making this daring march, the "Fram" had again turned northward, and, slowly drifting, reached the latitude of 85° 57′. This was the furthest point north at which an observation was possible, for clouds prevented the exact distance further from being determined, though it has been estimated on the "Fram" at as much as 30′ north of the 85° 57′ point. The ship then drifted to the south-west until, in February, 1896, it reached a point 84° 9′ N., 15° E.; there it remained stationary until released by the break-up of the pack in July. After that the vessel steamed southward through the leads, until she reached open water to the north of Spitzbergen on August 12.

It is as yet too early to attempt to discuss the value of the fresh information brought back by the "Fram" expedition; we may, however, briefly refer to the chief results. In the first place, there is no doubt now that the area round the North Pole is a deep ocean basin. In a remarkable lecture delivered to the Geographical Society in 1894, Professor Lapworth predicted, from geological considerations, that this would be found to be the case. As the orthodox view represented the Arctic Ocean as a shallow-water area studded with islands and archipelagoes, the correction of this error is of great importance in geography, meteorology, and geology. The depths proved by the "Fram" show that the great depression west of Spitzbergen is not a basin surrounded by shallow sea, but is widely open to the north, where it spreads over the polar area. The depth of this ocean renders it improbable that many islands will be found in it. It has been confidently asserted that there must be land to the north of Spitzbergen, as birds are seen flying northward from it. The voyage of the "Fram" has, however, shown that there is no land in the position expected, and once again we are taught that birds make mistakes as well as other animals. Another bogey from which Nansen has relieved us is that the whole of the central Arctic Sea is full of ice of immense thickness and great age. He found that, except for local heaps and hummocks, it is only about thirty feet thick, and thus the great "palæocrystic ice" and floe-bergs of north-western Greenland are proved to be exceptional. After this discovery, geology will no longer be burdened with the incubus of a recent Polar ice-cap. Another interesting geological contribution is Nansen's collection of Jurassic fossils in northern Franz Josef Land.

In regard to the Trans-Polar Current, it seems very doubtful whether Dr. Nansen's theory be true. At first sight, when we compare the projected and actual routes of the "Fram," and allow for the fact that the vessel was frozen in further west than was intended, their agreement seems clear proof of Nansen's theory. When we enquire more closely, however, the results of Nansen's voyage appear as fatal to the existence of the supposed current as they are to the explanation offered by some English geographers of the facts from which Nansen argued. The idea that a steady current flows across the Pole from north-western Siberia receives little support: the "Fram" drifted in accordance with the prevailing winds; when the wind reversed its direction the "Fram" floated backward. It was the winds and not an ocean current that carried it on its course.

It is, no doubt, true, that ocean currents are due to the wind, and that, if the prevailing winds blow from the New Siberia Islands to the Pole, and thence southward into the North Atlantic, there will be a drift of water in the same direction. But this in an open ocean such as the Arctic, would simply mean a superficial, variable drift, and not a true ocean current.

It is important to notice that the "Fram" floated northward in the winter and spring, and southward in the summer: this is exactly the opposite of what many of Dr. Nansen's critics predicted. They explained the northward drift of the ice off the Siberian coast as due to its being forced back by the discharge of the great rivers; in that case the northward movement ought to have been at its greatest in the early summer, and to have stopped in the winter.

In spite of the poverty of the Arctic sea, and Nansen's short journey on land, naturalists will await with impatience the detailed account of the results of his expedition. These will, no doubt, be found to repay the magnificent patience and courage of Dr. Nansen and his colleagues. His march with Johansen must certainly be reckoned as one of the most daring feats in the annals of Arctic travel; but its courage was far exceeded by the reckless hardihood with which, instead of returning to the "Fram" (as the explorers could, no doubt, have done, had they arranged to do so), they set off for Spitzbergen, a journey of ten times the length. Such a feat was only possible to men skilful with kayak and ski, who knew how to live on the feeble resources of an Arctic island. For daring and neatness of execution, the Nansen Expedition is probably unrivalled in Arctic history, while, to find a parallel for the extent of new area traversed and richness in results, we have to go back to the days of Franklin and Parry.

While the voyage of the "Fram" has been collecting the materials for a final solution of the "Trans-Polar Current" question, great doubt has been thrown on the most striking piece of evidence which suggested it. The resemblances between the fauna of the Greenland and Spitzbergen seas do not count for much, as the whole circum-polar fauna is remarkably uniform. The argument from the

"Jeannette" relics was more weighty. It is true that these may be genuine without proving the truth of Nansen's theory; for the Norwegian ice-pilots claim that the relics must have drifted westward, parallel to the Siberian coast, and been carried by the Polar Current, round the southern end of Spitzbergen, into the Atlantic, and thence across to Greenland. There are many facts which show that this route is possible. But the alternative routes are now of little importance, as Dr. W. H. Dall[1] has adduced weighty reasons for the conclusion that the supposed discovery of the "Jeannette" relics was a hoax; these relics have played such an important part in recent Arctic discussions, that his paper must rank as not one of the least important contributions to the Arctic work of the year.

Nansen's return with the "Windward" has directed prominent attention to the work of the Jackson-Harmsworth Expedition in Franz Josef Land, whose geographical task has been considerably restricted by Nansen's revelation of the area to the north. So far as a possible approach to the Pole is concerned, Jackson is handicapped by the nature of his base of departure. The country was chosen on the idea that it offered the only line of approach which had not been proved impossible. Nansen now tells us that he regards it as a good place in which to come out of the Polar pack, but as one of the worst places from which to enter it. It seems therefore doubtful whether the members of the expedition are likely to beat their record of 1895, which this year they were unable to equal. But this limitation of their sphere of operations does not in any way mean that the expedition will not be successful. The opportunities for a full year's meteorological record north of 75° occur very seldom: now, thanks to the generosity of Mr. Harmsworth, there will be available a complete three or more years' two-hourly record for a locality at 80°. Such a contribution to science is of inestimable value.

The two previous maps of Franz Josef Land, those of Payer and Leigh Smith, are necessarily very incomplete. During Payer's daring sledge excursion in June, 1874, by which the islands were first reached, the opportunities for mapping were very limited. Hence, it is not surprising that there are many alterations to be made in those portions of Payer's map which were inserted on the strength of occasional distant views in bad weather. Payer's reputation as a scientific geographer is well established; and when Jackson's map appears and we are able to compare it with Payer's hasty sketch, we shall probably feel regret for the Austrian traveller's limited opportunities, and respect for his courage, rather than surprise at his errors. Fortunately, we may now expect from Mr. Jackson a detailed map of the archipelago, and from his colleagues, Messrs. Fisher and Child, a reliable account of its geology, botany, and zoology. A complete monograph on Franz Josef Land will well repay Mr. Harmsworth's

[1] "On the supposed 'Jeannette' relics." *Nat. Geogr. Journal*, vol. vii., pp. 93–98.

munificent generosity, and the persevering and courageous efforts of Mr. Jackson and his colleagues.

The easiness of access of the western coast of Spitzbergen has rendered that island one of the best frequented of Arctic lands. An old prophecy of Reclus' has this year been fulfilled by the erection of a tourist hotel on the shores of Ice Fjord. Five excursions will be made there every summer, so that in future this will be a convenient base for explorations. Up to the present year very little work had been done in the interior. Baron Nordenskiöld and Palander traversed the inland ice of North East Land in June, 1873; the late Gustaf Nordenskiöld marched from Horn Sound northward to Bel Sound in 1892, and in the same year Mr. C. Rabot made a short excursion inland from the extreme head of Ice Fjord. Otherwise, explorations have been limited to a day's march from the coast. Sir Martin Conway, therefore, organised an expedition in order to cross Spitzbergen and work out the topography, geology, and natural history of a zone across it. The expedition landed in Advent Bay on June 19, and spent two months in exploration. During this time Conway crossed to the east coast at Agardh Bay, making a careful map of the route, while his companions, Mr. E. J. Garwood and the writer, studied its geology and natural history. Meanwhile, Mr. Trevor-Battye and Mr. H. E. Conway worked in Ice Fjord and Dickson Bay.

Subsequently the whole expedition, in a small iron steamer, the "Expres," visited the Seven Islands, and went down Hinlopen Strait to the broad Olga Strait. It was hoped thence to work through Hell Sound, or Walter Thymen Strait, into Stor Fjord. If that could have been done Spitzbergen could have been circumnavigated; but the two straits were choked with fast ice, and the steamer was driven eastward, almost to Prince Charles' Islands. The ice here, also, was impenetrable, and the steamer had to return through Hinlopen Strait, and thence back to Advent Bay by the west coast. Subsequently, Mr. Trevor-Battye and Mr. Garwood ascended Hornsund Tind, the highest peak in Spitzbergen, and returned to Norway in the "Expres."

The Conway Expedition, though much shorter than any of the others, covered a good deal of ground, and has returned with much fresh information and large collections from the hitherto unknown interior of one of the most instructive of Arctic islands. While Sir Martin Conway was mapping the interior of Spitzbergen, Baron de Geer and Lieutenant Knorring were engaged in a detailed trigonometrical survey of Ice Fjord, and a study of the snouts of the glaciers that flow into it.

Considerable attention was attracted to Spitzbergen this year, as it was made the scene of a very novel effort in Arctic exploration. Unfortunately, some delays in preparation and the unfavourable conditions of weather have kept back Andrée's contributions to Arctic results till next year. His balloon was not ready till late in July; and to have started after the end of that month would have greatly increased

risks already enormous. Andrée has, however, shown that it is possible to fill a balloon in the north of Spitzbergen, and to keep it inflated for several weeks. Both of these feats were declared to be impossible by some of Andrée's critics, though it is gratifying to remember that the English military aëronaut, Colonel Watson, ridiculed these fears.

Andrée's return has subjected him to a certain amount of hostile criticism; but it is impossible to talk to him without feeling that he is an enthusiast and thoroughly in earnest. Pike's Bay, where he erected his gasworks and balloon-shed, is generally accessible in a wooden vessel in May, or even in April. South winds very rarely occur in Spitzbergen after July 24–25, though they are not unusual in the end of June and the beginning of July. If, therefore, Andreé can next year reach his starting point much earlier, and be ready to start by the end of June; and if he can then keep his balloon afloat for three weeks, the chances are that he will travel a long way toward the Pole, and then be carried southward. If he reach the 70° parallel, the chances are nine to one that he will be able to descend on land. Daring, therefore, though this balloon adventure be, it does not seem quite such an act of idiotic and wilful suicide as many of Andrée's critics declare.

J. W. Gregory.

II.

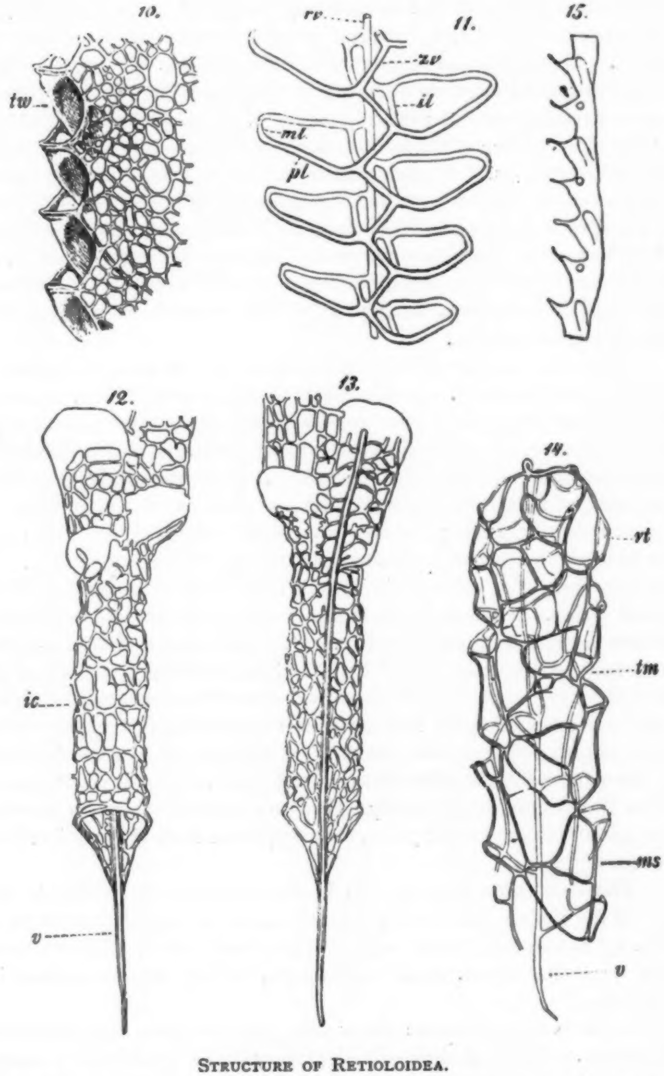
The Structure of the Graptolites.

II.—Retioloidea.

THIS group is not yet well enough known for us to establish a definite plan of structure, supposing such to have existed. In any case, the group seems rather isolated from the rest of the graptolites, as well as considerably more heterogeneous than the other groups. Consequently a general account could not be given in a small compass, but would involve detailed abstracts of several papers, especially of those by Tullberg, Törnquist, Holm, and myself, together with the reproduction of many figures. I therefore only reproduce some figures from Holm (Figs. 10 and 11) and myself (Figs. 12–14).

Fig. 10 shows a part of the net-work of *Stomatograptus törnquisti*, Tullb., with the large pores and remains of the interthecal walls. Similar interthecal walls have been observed by Holm in *Retiolites geinitzianus*, Barr. Fig. 11 is taken from one of Holm's drawings of the last-mentioned species, but has been simplified by the removal of the whole net-work between the main strands: *rv* is called the straight virgula; *zv* the zigzag virgula; *pl* the parietal strand separating two thecæ; *ml* the mouth strand separating the mouths of two adjoining thecæ, also called the inner cross-rod. How the proximal end was constructed, if there was anything like a sicula, and, if so, how it was constructed, cannot be gathered from the material to hand.

In the work (7) from which these figures are taken, Holm describes some fragments of a new species, which he refers temporarily to the genus *Retiolites* under the name *R. nassa*. Of this species I have succeeded in obtaining such good material that it has, perhaps, become the best known representative for the group Retioloidea (Fig. 12–14). Except for the complete strand and mesh system, and the lower theca-edges developed into a kind of lid, nothing of the periderm remains but here and there in the meshes small fragments of a membrane, which probably among other things filled the meshes. There is only one virgula, and it is straight. Morphologically it does not correspond to the virgula in the Graptoloidea. A true sicula cannot be distinguished, though there is an organ or individual corresponding to it. This initial canal, as I at present call the part from the proximal end to the first theca, is almost circular in section, with a depression where the virgula is situated. A certain regularity



STRUCTURE OF RETIOLOIDEA.

FIG. 10.—*Stomatograptus törnquisti*, part of the net-work. FIG. 11.—*Retiolites geinitzianus*, the main strands of the net-work. FIG. 12.—*Retiolites nassa*, proximal end from the anti-virgula side. FIG. 13.—The same from the virgula side. FIG. 14.—Distal end of same, showing main strands only. FIG. 15.—*Dictyonema rarum*, a portion from the side, showing nest-shaped organs. All greatly enlarged.

tw, thecal wall. *tm*, thecal mouth. *rt*, rudimentary theca. *v*, virgula. *rv*, straight virgula. *zv*, zigzag virgula. *il*, inner strand. *pl*, parietal strand. *ml*, mouth strand. *ms*, main side strand, limiting the thecal field and the anti-virgula field. *ic*, initial canal.

in the arrangement of the meshes may be traced, in the fact that on the virgula-side (Fig. 13) stouter strands bend downward and run round. These join the virgula at an acute angle. In the specimen here represented they are only five in number. The proximal one is somewhat coarser, and probably formed the mouth of the individual. In the distal region of the initial canal, on the other hand, the meshes are quite irregular. I have noticed the initial canal in only twelve specimens, although I have had several hundred at my disposal. One of these is complete, and has a length of 26 mm. A glance at Figs. 12 and 13 shows that the closeness of the meshes varies greatly. I do not believe that the different sizes of mesh correspond to different ages in the full-grown rhabdosome,[1] but consider them simply as instances of variation.

With the ceasing of the initial canal the rhabdosome begins to assume another shape. At the height of the second theca, from out the confusion of meshes there appear at the angles four main strands, which run through almost the whole rhabdosome. These main strands divide the rhabdosome into four fields, almost at right angles to one another: the virgula field, the two halves of which form an obtuse reëntrant angle; the opposite plane or anti-virgula field; and the two somewhat convex thecal fields situated on either side. At the same height as these main strands there arise in the middle of the thecal fields, by each theca-mouth, discontinuous and somewhat thinner longitudinal strands (Fig. 14). Each theca-mouth occupies the whole width of the thecal field, and is therefore bounded at the sides by the vertical main strands. Above and below the theca-mouths are bounded by two horizontal cross-strands connecting the main strands. The more meshes there are that occupy the intervals between these few strands, the broader become the lower cross-strands of the theca-mouths, till finally where the meshes are most compact they grow into crescentic plates covering more than the whole theca-mouth.

The first theca does not lie in the thecal field, which in this part of the rhabdosome hardly yet exists, but obliquely, so that its lid (Fig. 13) is attached by one corner to the virgula itself. All specimens with an initial canal, that I have seen, belong to fine-meshed individuals.

As the meshes become closer they arrange themselves somewhat differently. In the anti-virgula field they have no definite arrangement, neither can any main strands of the second order be distinguished. In the virgula field, on the contrary, they tend to arrange themselves in four longitudinal series. This, however, is not generally carried to any great extent, and one can hardly speak of any new main strands. In the thecal fields this arrangement is more evident. The strands are not hollow; not even the virgula is that.

[1] Owing to an error this word was printed "rhabdome" in the first part of this article.

At a certain distance from the proximal end the virgula leaves its former place in the periderm net and runs free within it, so as to rejoin the periderm in the middle of the distal spine. The periderm also changes. In the region of the most distal thecæ the main strands begin to be effaced again; the periderm often becomes somewhat swollen out, and again assumes a somewhat circular shape. Almost the only regularity distinguishable in this confusion of meshes is the union of the strands in the distal spine, in such a manner that it seems as though the virgula, which here meets them, branches dichotomously four times, and in that way passes into the net-work. Further, two pairs of branches of the fourth division include two triangular meshes, which lie opposite each other in the effaced thecal fields, and these triangles Holm has explained as the rudiments of the last thecæ. The interior cross-strands are not present here.

As Holm has already pointed out, as regards the arrangement of the thecæ, this species bears the same relation to *Retiolites geinitzianus* as *Climacograptus* bears to *Diplograptus*.

The material examined is from Lilla Carlsö, a small island near Gotland, and is said to come from bed *c* of Lindström, which corresponds to the Wenlock Shale.

III.—Dendroidea.

In 1890 Holm described in *Dictyonema cervicorne*, Holm, some appendages to the thecæ, shaped like birds' nests, and considered that they might possibly be gonangia. Subsequently, when I examined Dendroidea, by means of series of sections, I discovered in the periderm cavities situated just like these nest-shaped organs. In Fig. 15, which represents *Dictyonema rarum*, Wiman, a little hole is to be seen near every second theca. On the opposite side there are similar little holes alternating with those on the visible side. It is these that correspond to Holm's nest-shaped organs.

We now proceed to Fig. 16, which represents selected sections from a complete series of this graptolite, and compare the different sections with Fig. 15.

In all Dendroidea one can distinguish three different kinds of individuals: *nourishing individuals*, which I also call thecæ, since they doubtless correspond to the thecæ in the Graptoloidea; these are denoted in Fig. 16 by t, t_1, t_2, etc.; *budding individuals*, which are denoted by k_1, k_2, etc.; and *sexual individuals* or *gonangia*, denoted by g, g_1, g_2, etc.

In section 1, Fig. 16, are seen three thecæ t, t_1, and the small undenoted hole to the right of t_1 between g_1 and k_1; besides these are seen two gonangia, g and g_1, and finally two budding individuals, one of which consists of the cavity in which the above-mentioned t_2, g_1 and k_1 lie, the other of k_1. In section 2 the gonangium g, which up till now has been on the left side, has pressed between t and the other individuals, and opens on the right side. In section 3, t

begins to cease. In 4, t_2 begins to grow. In 5, t_2 has further widened itself. In section 6, the budding individual k_1 has produced three new individuals, which have not yet had time to become large enough to press their own walls against those of the mother animal. The new individuals are: one unnamed theca, which ought to be denoted by t_3; one gonangium, g_2; and one budding individual, k_2. In all Dendroidea the individual is always formed in this manner.

In section 7 the new individuals t_3, k_2 and g_2 have pressed their walls against those of the mother animal, so that the whole section has become as it were a reflection of section 1. Moreover, in section 7 just as in section 1 the individuals have begun to

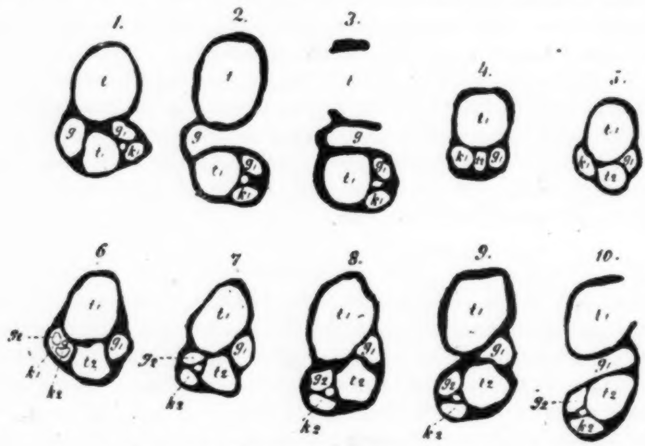


FIG. 16.—SERIES OF TRANSVERSE SECTIONS OF *Dictyonema rarum*.
For explanation of lettering, see text.

be shoved apart in order to let the gonangium g_1 pass over to the left side. This separation is increased in sections 8 and 9; and finally g_1 opens in section 10, which is the reflection of section 2.

In *Dictyonema rarum* the gonangium is situated on the one side, and opens directly outward on the opposite side of the branch. In *Dendrograptus* (?) *bottnicus*, Wiman, which as regards its internal structure otherwise differs little from *Dictyonema rarum*, the gonangium also opens directly outward, but on the same side of the branch as that on which it is formed.

In *Dictyonema peltatum*, Wiman, the gonangium also opens on the side on which it has grown, not, however, immediately outward, but in or almost together with the theca, next to which it is situated. The same is the case in *Dendrograptus* (?) *œlandicus*, Wiman, and *Dendrograpticus* (?) *balticus*, Wiman.

In *Dictyonema peltatum* I have had an opportunity of noticing an occurrence which may be quite common in the Dendroidea, although in consequence of the nature of the material it cannot very often be

observed. This was that the newly-formed budding individual, when at about the same stage as k_2 in section 6 of Fig. 16, and thus before it had become joined to the wall of the mother animal, had already formed within itself a new triple generation. A section through such a region therefore passes through no less than nine individuals.

Of *Dictyonema flabelliforme*, Eichw., I have not had altogether satisfactory material; a cross-section of this species, however, makes it highly probable that it too is built on the same plan. At all events, its branches are not as simply constructed as those of the Graptoloidea. It was naturally of interest to study how the branching took place. Fig. 17 is meant to show its origin in *Dendrograptus* (?) *ælandicus*. Section *a* is almost on the same stage as section 6 in Fig. 16. We have thecæ 1 and 2, and to the right the gonangium, which opens

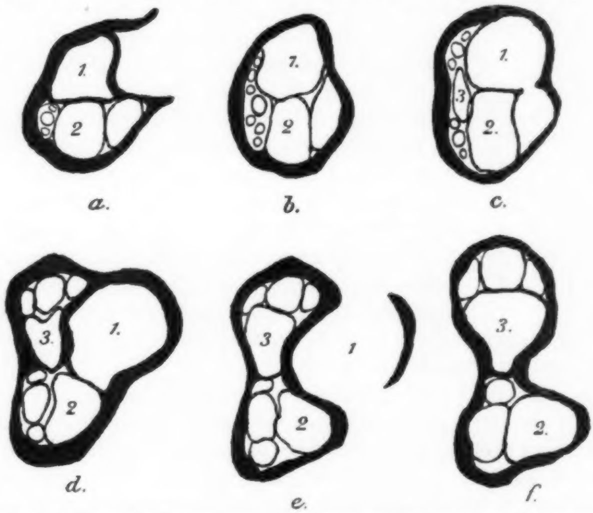


FIG. 17.—SERIES OF TRANSVERSE SECTIONS OF *Dendrograptus* (?) *ælandicus*. For explanation of lettering, see text.

in theca 1 in section *c*. To the left of theca 2 are the three new individuals, of which the larger one in the middle is a theca. Now, if the branch were not about to divide, the upper of the two other new individuals would be a gonangium; but that is not the case, for if we go to section *b*, we see that *both* the small new individuals were budding individuals, since each has produced three new individuals of ordinary shape. In section *c* these new ones assume a somewhat different size, and begin to group themselves in two divisions. In section *d* this grouping has considerably advanced. In *e* the old theca 1 is coming to an end, and in *f* the new branches are just about to separate. Of the previously existing individuals that were in the mother branch, in this genus there is in the new branches only one theca, viz., 2. I have noticed almost the same mode

of branching in *Dendrograptus* (?) *balticus*, *Dendrograptus* (?) *bottnicus*, and *Dictyonema peltatum*. It seems, therefore, to be fairly common. There are, however, some variations. For instance, in *Dictyonema peltatum*, of the individuals already developed in the mother branch, an old theca passes up into the one branch, and into the other an old theca and an old gonangium.

I now proceed to the description of a dendroid graptolite o somewhat different structure, *Ptilograptus suecicus*, Wiman, Fig. 18. Here at the outset we have to distinguish between twigs and branches. The branches carry twigs springing out feather-fashion alternately to right and left, and these consist of four individuals, opening one after the other. The first opens on the back, in the angle between the branch and the twig, and therefore is not visible on Fig. 18. The second is seen opening on Fig. 18. The third again opens on the back of the twig, at about the same height as the second. The fourth is terminal. On the branches, which together give the rhabdosome a bush-like growth, no individuals open, but on the other hand they are all placed immediately on these. In Fig. 19, section *A*, are seen four individuals, *a*, *b*, *c*, and 1, which will open in connection with a left-hand branch. The individuals a_1, b_1, c_1, and 2 open with the next right-hand branch. Of individuals belonging to the next left-hand branch only b_{ii} is as yet ready; *d* is a budding individual, and such never open outwards.

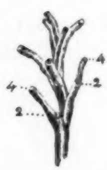


FIG. 18.—BRANCH OF *Ptilograptus suecicus*.
2 and 4, openings of second and fourth individuals in the proximal twigs of the right and left sides.

As sections *A* and *N* are the reversed images of each other, we can make the series as long as we want. Towards the proximal end we may prolong the series from *A* backwards, with the reversed images of sections *N*, *M*, *L*, etc., and towards the distal end we may prolong it from *N* onwards, with the reversed images of sections *A*, *B*, *C*, etc. If we now, to begin with, follow the series backwards to the reversed image of section *N*, we find that the individuals c_1, 2 and *d* in *A* are three young brother individuals, of which *d*, as is shown by section *F*, is a budding individual, while 2 is a theca, and c_1 is a gonangium. Frequent repetition of the same operation shows that the individuals belong together in generations in the following way. In the table I begin with the oldest generations:—

Generation.	Gonangium.	Theca.	Budding Individual.
1	—	b	—
2	a	b_1	—
3	c	1	—
4	a_1	b_{ii}	—
5	c_1	2	d
6	a_{ii}	b_{iii}	d_1
7	c_{ii}	3	d_{ii}

From this table the age of each individual is at once seen. The

individuals arise, as usual, in threes. Of these only two open, the gonangium and the theca. Now, since the individuals open in fours, one might expect that these four individuals would belong to two consecutive generations. That, however, is not the case, for the four individuals of each separate twig belong to three different generations, as is shown by a comparison between the above table and the following statement of the components of each twig:—

Thecæ b and 1	Gonangia a and c	Left-hand twig.
„ b_1 „ 2	„ a_1 „ c_1	Right „
„ b_2 „ 3	„ a_2 „ c_2	Left „
„ b_3		

On each twig there are thus two thecæ and two gonangia. The gonangia are so placed that the elder always opens like a, the younger

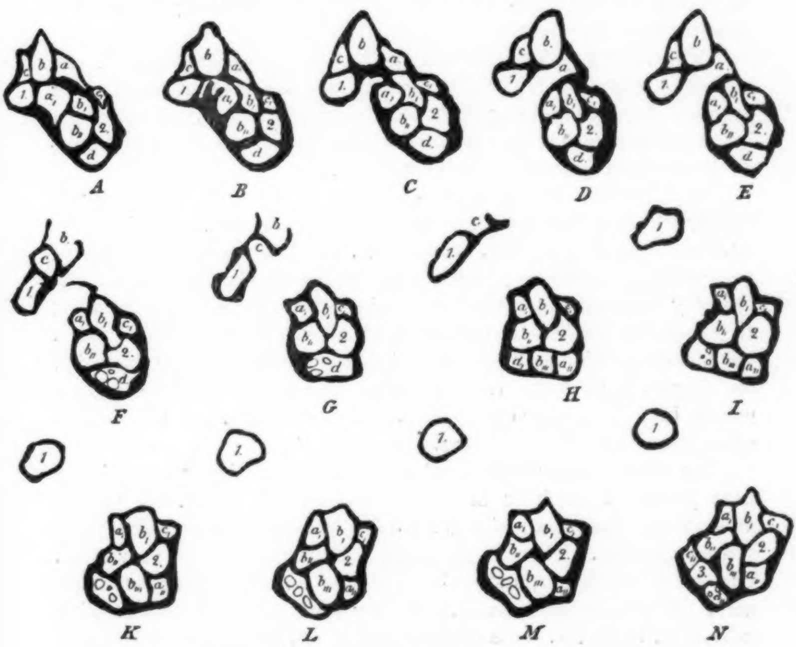


FIG. 19.—SERIES OF TRANSVERSE SECTIONS OF *Ptilograptus suecicus*. For explanation of lettering, see text.

like c, and thus it is that they always come to lie on the back of the twigs. The two gonangia belong to two consecutive generations. The thecæ, on the contrary, that open in any one twig are originally separated by one or two generations. The elder theca opens like b, the younger like 1.

The only real difference between this genus and, say, a *Dictyonema* will thus consist in the individuals here being kept together for some time, so as then to open in alternate groups, which I call twigs. As

has already been shown by the note of interrogation always placed after the name *Dendrograptus,* I am uncertain to what genus the forms ought to be referred. This depends on the fact that the old generic diagnoses were drawn up at a time when the structure of the dendroids was as good as unknown; they are therefore generally of no, or at least of undecided, value, and always taken from the external characters of specimens found in slate, and usually in a bad state of preservation. The classification therefore needs a thorough revision, but the time does not seem to me yet ripe for such an undertaking, since we are not yet in a position to estimate the relative value even of characters collected from the internal structure. For instance, a classification of the Dendroidea according to the way the gonangia open might perhaps be as artificial as the old one. At all events, we had better postpone the task of classifying till more is known about the structure of the proximal end.

Thus, forms with a sicula, such as *Dictyonema flabelliforme,* and forms without a sicula, such as *Dictyonema peltatum,* are now put together, on account of the connecting fibres between the branches. I do not yet know the structure of the proximal end in more than the last-named *Dictyonema* and one still undescribed form.

In *Dictyonema peltatum* a large number of branches spread centrifugally within a disc, and then rise up at different distances from the middle of the disc, branch, anastomose, and join again by means of the ordinary connecting fibres, thus giving to the rhabdosome the ordinary funnel-shape. The proximal ends of the branches do not at all possess the intricate structure that characterises the distal parts, but in cross-section look just like a branch of *Monograptus,* except that the virgula is missing. In the region where this simple structure passes into the more complicated one, the rhabdosome was broken when cleaned out from the flint.

The other undescribed species begins with a disc, from which a stem proceeds, much as in *Odontocaulis keepingi,* Lapw. A section through the lowest part of this stem also resembles the cross-section of a *Monograptus.* There is no virgula. The periderm is very thick. The one hole is larger, and is the section of a theca that opens on the stem. The other one is small, and very soon proves to be a budding individual, in that it, some sections higher up, has produced and contains the ordinary three individuals: a theca, a budding individual, and a gonangium. Probably the course of growth is the same in each separate branch of *Dictyonema peltatum.*

There is no reason for fitting in the graptolites in any of the classes of the animal kingdom that now exist. The resemblances to *Rhabdopleura,* the bryozoans, the hydroids, and others, are only such as easily arise between colony-building animals of even a widely-separated systematic position. Even as to their approximate position in the system not much more can be said than that they are Invertebrata;

and this need not seem strange if we remember that even a recent animal of well-known anatomy may within a fairly short time be assigned to widely-separated classes of the animal kingdom.

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T

III.

An Introduction to the Study of Anthropoid Apes.—II. The Chimpanzee.

The Chimpanzee in Europe.—However desirable, it is almost impossible to give an approximately accurate statement of the amount of material, the live animals studied in confinement, the skeletons and carcases studied in museums and dissecting rooms, upon which is based our knowledge of the chimpanzee species. There is to be found in literature the description of parts belonging to over two hundred chimpanzees, but of that great number the anatomy of only one animal has been described with an approximation to completeness, that of Gratiolet (131), and even it lacks much. Small parts of many specimens have been studied and recorded with great accuracy, and by piecing these together one may obtain a rough mental picture of the structure of the species. The partial character of our knowledge results not from lack of material, but rather from its abundance. In the Gardens of the Zoological Society of London alone, during the last fifty years, there have been about fifty chimpanzees, and that number probably only represents about one-third of the live visitors to Europe. The chimpanzee, if its health could stand it, would take very kindly to confinement, for, when young at any rate, it is of a lively, playful, and contented disposition. As a rule, it does not keep its health in confinement in Europe. Of eight chimpanzees that came to the Gardens at Rotterdam, four lived between 1-27 days, four between 100-380 days. In the Gardens at London it appears to fare better, Sally, for instance, living eight years. Although a few instances might be collected of animals that have passed from three to five years in confinement, I do not think that, on an average, one could insure the chimpanzee for a six months of life in Europe. Of the animals in confinement, males and females occur in about equal numbers, but adults are unknown.

The Nervous System.—There are partial records of forty-eight chimpanzee brains, but, almost without exception, they deal with the surface anatomy only. A great deal of the work on this part of the subject is very excellent. Of treatises dealing with the fissures of the brain, Cunningham's best repays consultation (115, 116), and Rüdinger's (188) is of great worth. Very good descriptions and figures are given by Giacomini (130), Moeller (165), Beddard (93), Benham (94), Chapman (111), Dwight (123), Embleton (126), Barkow (90), Marshall

(158), Parker (178), Schroeder and Vrolik (196), Symington (202), Turner (207), while Traill (206), Tyson (208), and Macartney (155) give very fragmentary accounts. The convolutions, sulci, lobes, and fissures have been treated in a general way, but from fresh material, by Broca (103), Gratiolet (131), Hamy (136), Kükenthal and Ziehen (151), Pansch (176), Parker (177), and Rohon (185). The Island of Reil, its limiting sulci and opercula, the third frontal convolution, have received a great deal of attention, and respecting them the following authors may be consulted: Bischoff (4, 5), Cunningham (116, 117), Hervé (48), Marchand (157), and Rüdinger (188*a*). Of the deep anatomy of the brain, its commissures, its tracts, its deep and basal centres, and its peduncles, nothing is known except from inference. The ventricles have been touched upon by Schroeder and Vrolik (196), Moeller (165), Marshall (158), and Macartney (155). Moeller (166) has examined and described the *Hypopophysis* and *Epiphysis cerebri*.

The extent to which the cerebellum is overlapped by the occipital lobes of the cerebrum has been a matter of very keen observation, and has quite a considerable literature of its own. Like all points of anatomy that have given rise to a great deal of discussion and contradiction, it has turned out to vary widely with the individual, and to have received an amount of attention quite outside its real importance. As far as this matter concerns the chimpanzee, observations have been made by Chapman (111), Cunningham (115, 118), Macartney (155), Marshall (158), Moeller (166), Schroeder and Vrolik (196), and Wilder (213). For papers dealing with the weight of the chimpanzee brain, see Moeller (166) and Keith (146). There is no microscopic work on the brain, except that of Moeller (168). The *medulla oblongata* has been figured by Barkow (90), and its nerve centres examined and described by Kallius (145) and Cunningham (117). The external appearance of the spinal cord has been described by Kallius (145). Moeller (166, 167) has examined the finer structure of the optic chiasma.

The cranial nerves of the chimpanzee have never been examined with any degree of detail (Vrolik, 210). The *lumbar plexus*, especially the spinal nerves that enter into its formation, has received a very great deal of attention from Von Jhering (143), Ruge (191), Rosenberg (187*a*), and Utschneider (209). Hoefer (140) has given a full description of the nerves of the upper extremities, and Macalister (154) gives a figure of the *brachial plexus*. The nerves of both extremities have been dealt with by Champneys (110), Hepburn (45), Chapman (111), Gratiolet (131), Nepheu (170), Sutton (201), Traill (206), and Vrolik (210), but only the first two writers give at all a full description.

The Muscles.—Although the myology of eighteen chimpanzees has been described, only Gratiolet's (131) is an approximately complete treatise. Tyson's (208), Traill's (206), Vrolik's (210), Wilder's (212), Beddard's (93), Champneys' (110), Huxley's (49*b*), Embleton's (126), and Sutton's (201) are fairly full. Partial records of dissections are

given by Chapman (111), Dwight (123), Fick (127), Humphry (142), Macalister (154), Mayer (160), Symington (76), and Wyman (215). The muscles of the extremities have been very fully investigated by Hepburn (45), and from the articles of Brühl (108) and the fine figures of Barkow (90) a good deal may be learned concerning the myology of these parts. The muscular anatomy of the face has been very accurately worked out, although in very few specimens, by Ruge (70) and Rex (69*a*). The muscles that act on the digits have received much attention from Bischoff (100, 101), Brooks (106, 107), Keith (148), and Windle (214). Records of the *rectus abdominis* are given by Ruge (190) and Keith (148); of the *serratus posticus* and *obliquus abdominis externus* by Seydel (198, 199), and of the *levator ani* by Lartschneider (152*a*).

The above list, however formidable it may appear, in reality only indicates material enough to serve as an introduction to the myology of the species. The first necessity in the meantime is a thorough dissection and description of one animal to serve as a basis for further work, so that in detailing the dissection of any other individual one would have to record only the points wherein it differed from the 'type' description. Gratiolet's is the only description that could serve as a 'type,' and even it could be considerably improved upon. The lists that have been drawn up of muscular characters or peculiarities of the chimpanzee, or of a species or sub-species of chimpanzee, are almost without exception merely lists of characters peculiar to the individual that has been dissected. It is extremely probable that future and more accurate work will show that the myological characteristics of the anthropoids, especially of sub-species, lie not in any one, or any set of constant peculiarities, but in the proportion or frequency with which these peculiarities occur in a large number of individuals. Besides such census-taking work, however, good descriptions of the muscles of the palate, of the tongue, of the pharynx, of the back, and of the penis are required. The arrangement of the involuntary muscle of the œsophagus, stomach, bladder, and rectum would also repay investigation.

The Joints and Ligaments.—There is no thorough description of the ligaments and joints of the chimpanzee. Gratiolet's (131) is the most complete. Concerning those of the foot and ankle, see Thomson (204), Humphry (142), and Aeby (88). Traill (206), Sutton (201), Macalister (154), Humphry (142), and Hartmann (39), treat cursorily of some of the ligaments and joints. The synovial bursæ and tendinous sheaths, the ligaments of the trunk and pelvis, have scarcely been touched upon.

The Skull.—It is always an easier and more pleasant matter, when one wants to consult any point in the skull or skeleton, to refer to the originals in the shelves of a museum than to the descriptions of them in a library. At first, when such specimens were rare and costly, descriptions were necessary, but now, when they have become numerous and common, descriptions, unless there is something uncommon to record, are superfluous. What is really wanted is a

tabulation of the characters of a long series, say of one hundred, of skulls. As in the myology of the chimpanzee, so in the skulls, there is quite an enormous amount of individual variation, most of the features that have been assigned as characters of sub-species being in reality only individual peculiarities, although it is highly probable, especially in connection with the skulls of Central African chimpanzees, that if a large series of this supposed species were contrasted with a large series of the ordinary West African animal, a very distinct difference in mass would be noted between them. The collections in museums are rapidly becoming big enough for such an undertaking. In London museums, for instance, in the museums of South Kensington, Royal College of Surgeons, and of the various medical and scientific schools, there are over sixty chimpanzee skulls, most of them with the necessary history attached to them; and in the museums of Europe and America, there are, at a low estimate, over three hundred skulls, certainly material enough for working out a very full understanding of this part of the chimpanzee. Anyone who has tried to bring all the descriptions of skulls in periodical and academical literature together and fuse them into a concise and clear whole, must have felt the wish to start the whole subject afresh upon our greatly increased stock of material. At best the literature upon the skull will serve only as an introduction to anyone who wants to start work on fresh material; it is almost useless for the purpose of addition to his own research. It is rather a big literature, the smaller articles, dealing with some definite structure or variation, being the most satisfactory. Such are those, for instance, of Thomson (205), Regnault (182), and Bianchi (95), dealing with the lachrymo-ethmoidal suture; of Maggi (156) dealing with the cranio-pharyngeal canal; Zuckerkandl's (216) with the turbinate bones; Morselli's (169) with the vermian fossa; of Chudzinski (113) and Manouvrier (156*a*) with the nasal bones; of Hamy (35) with the nasal spine; of Sutton (201) on certain foramin of the skull; of Bischoff (8) on the cranial indices; and of Flower (128) on an acrocephalic skull. Partial records or figures of skulls are given by Barkow (90), Lenz (53), Meyer (58, 59), Hartmann (40), Gratiolet (131), Dwight (123), Bolau (10), Bischoff (96), Beddard (93), Traill (206), and Vrolik (210). Keith (146) treats of the cranial capacity. The literature upon the skull of the Central African chimpanzee is by Giglioli (31), Hartmann (138), Issel (144), and Noack (171). Owen (175), Huxley (49*b*), Duvernoy (22), Bischoff (3), and Hartmann (138, 38) describe the characters of the chimpanzee skull in a general way, pointing out its generic, specific, and sexual characters, and the changes it undergoes with age.

The Skeleton.—One may say of the other bones as of the skull: it is an easier and more satisfactory matter to refer to specimens than to literature. For articles dealing with the chimpanzee skeleton as a whole one may consult Owen (175), Mivart (61, 61*a*), Duvernoy (22), Hartmann (138, 38), Bouvier (102), and Gratiolet (131). Records or

figures of one or more skeletons are given by Bolau (10), Dwight (123), Barkow (90), Lenz (53), Meyer (58), Tyson (208), Vrolik (210), and Traill (206). Cunningham (118, 119), deals with the curve and cartilage of the lumbar region of the vertebral column; Broca (104), Chudzinski (112), and Paterson (179) with the sacral and coccygeal vertebræ; Keith (149) with the *manubrium sterni*; Rosenberg (187*a*) and Wyman (215) with the regional series of vertebræ; Sutton (201), Rosenberg (187*a*), Lucae (54), and Vrolik (210) with the bones of the hand; Lazarus (153), Lucae (54), Humphry (142), and Thomson (204) with the bones of the foot. Records of measurements of bones are given more especially by Rollet (186*a*), Meyer (58), Issel (144), Lucae (54), Slack (73), and Wyman (87*b*).

The Teeth.—Great weight has been placed upon the form and structure of the teeth of the chimpanzee for classificatory purposes, especially for establishing its generic value, and upon the cusps of the last molar teeth for establishing the specific value of certain groups of chimpanzees. It must be admitted that the enamel on the cusps of the gorilla's teeth assumes, as a rule, a sharp crystalline form never found on the teeth of the chimpanzee, and gives support to those that separate the gorillas from the chimpanzees as two well-marked and separated genera; but the last molar teeth, being of the nature of degenerating structures in the chimpanzee, and therefore very variable, are quite unreliable characters for splitting the group into species or sub-species. Very probably a fifth cusp appears much more frequently on the last lower molar of the individuals of one variety of chimpanzee than on the last lower molar of another variety; but its presence or absence can never be accepted as diagnostic. It will be some time before such points can be settled, because the skulls only have the teeth in a fit condition for study from a little time before until a little time after the animals have reached maturity, and it must take time to accumulate such a series. Irregularities in the dental series have been recorded by Bateson (92) and Bischoff (96). Descriptions and figures are given by Duvernoy (22), Ehlers (23), Beddard (93), Giglioli (31), Gratiolet (131) and Barkow (90). Practically nothing is known of the dates of irruption, although some data in connection with this matter may be picked from Beddard (93), Broderip (105), and Magitot (56). Topinard (82) treats of the variations of the cusps. Huxley, Tomes, and Owen (174) deal with the teeth in their well-known general treatises.

The Alimentary System.—Figures or descriptions of the tongue, dealing mostly with its papillæ, are given by Bischoff (7), Cunningham (118), Duvernoy (22), Dwight (123), Ehlers (23), Flower (28), Gratiolet (131), Humphry (142), Cavanna (109), Mayer (162), Symington (202), Traill (206), and Tyson (208). It is very noticeable in the literature of the anthropoids, as exemplified by the literature on the tongue, how subsequent observers pay particular attention to, and discuss, the points raised by their predecessors, so that one

may safely assume that any point or question, once raised, is sure in time to gather a very full literature round it. It has been so also with the rugæ of the hard palate. Bischoff (7), Beddard (93), Ehlers (23), Gratiolet (131), Symington (202), and Waldeyer (211) figure or describe them. Ehlers (23) describes the buccal folds of mucous membrane that occur between the gums and cheeks, and Tyson (208) and Symington (202) also have made observations on the cavity of the mouth. Tyson (208) and Gratiolet (131) have made some observations on the salivary glands. Barkow (90) gives a very fine drawing of the stomach and its blood vessels; Bischoff (99), Cavanna (109), Gratiolet (131), Traill (206), and Tyson (208) give descriptions of the stomach; certain points concerning the length and form of the intestine have been recorded by Bischoff (99), Cavanna (109), Chapman (111), Dwight (123), Ehlers (23), Flower (28), Gratiolet (131), Huxley (49*b*), Barkow (90), Symington (202), Traill (206), and Tyson (208), while Embleton (126), Mayer (160), Owen (172, 173), and Vrolik (210) make minor contributions to the same subject. Cunningham (118) gives a very fine figure of a section, showing the topographical relationships of the abdominal viscera. Figures or descriptions of the liver are given by Bischoff (99), Flower (28), Gratiolet (131), Barkow (90), Cavanna (109), Symington (202), Traill (206), and Tyson (208); of the pancreas by Bischoff, Flower, Gratiolet, Cavanna, and Tyson (*opp. citt.*)

The Respiratory System.—The air sacs of the larynx have got quite an extensive literature of their own, and although their morphology and development may be said to be fairly well known, we are as far from knowing their functional meaning as ever. There have been nearly as many theories regarding their nature as there have been observers. Records of them may be found written by Bischoff (99), Chapman (111), Cunningham (118), Deniker and Boulart (19), Duvernoy (22), Ehlers (23), Mayer (161), Traill (206), Tyson (208), and Vrolik (210). The best work on the structure of the larynx and its muscles has been done by Gratiolet (131) and Mayer (161); but Bischoff (99), Cunningham (118), Ehlers (23), Humphry (142), Barkow (90), Symington (202), Traill (206), Tyson (208), and Vrolik (210) give descriptions of many points worth referring to. The trachea and bronchi have partial records by Aeby (88*a*), Ehlers (23), and Gratiolet (131). The lungs have been examined by Mayer (161), Ehlers (23), Gratiolet (131), Cavanna (109), Traill, Tyson, and Vrolik (*opp. citt.*) The limits of the pleura and its variations have been very accurately described and figured by Ruge (189) and Tanja (203). Cunningham's section (118) shows very well the relationships of the lungs, trachea and larynx.

The Circulatory System.—The heart of the chimpanzee is so similar to that of man, that there is little left to observe or describe. Its position and relationships have been investigated by Ruge (189), and can be well seen in Cunningham's section (118). Bischoff (99),

Dwight (123), Ehlers (23), Gratiolet (131), Cavanna (109), Traill (206), Tyson (208), and Vrolik (210) give some details concerning it. The arch of the aorta and its branches are described or figured by nearly all the above writers, their observations being brought together by Keith (147). The arterial and venous systems have been recorded in a very fragmentary way. Barkow's figures (90) give much better information as to their distribution than any other record; but a good deal concerning the arteries may be obtained from Bischoff (99), Chapman (111), Dwight (123), Ehlers (23), Gratiolet (131), Humphry (142), and Sutton (201). Ruge (189) described the relationships of the pericardium, while Gulliver (135) has made a study of the size of the red blood corpuscles.

The Lymphatic System and Ductless Glands.—There has as yet been no proper investigation of this system. The spleen has scarcely been more than mentioned—Bischoff (99), Gratiolet (131), Symington (202), and Tyson (208). The thyroid has been remarked upon only by Bischoff (99), and Ehlers (23), and, so far as I know, no work has been done upon the lymphatic system or upon the thymus.

The Genito-Urinary System.—The external genitals of young female animals have been figured or described by Bischoff (6, 99), Chapman (111), Gratiolet (131), Hartmann (42), Barkow (90), Hoffmann (141), Symington (202), and Traill (206); the external genitals of the male by Duvernoy (22), Barkow (90), and Tyson (208); Crisp (114) has made observations on the *os penis*. The external genitals are of surprisingly small development; but it must be kept in mind that they have been studied upon animals, for the greater part, quite immature, or, if adult, upon subjects contracted by long immersion in alcohol. The uterus and internal organs of the female are described by Hoffmann (141), Symington (202), Gratiolet (131), Bischoff (6, 99), and Traill (208). So far as I know, Bolau (23) is the only one who has observed menstruation in the chimpanzee. The prostate, *vesiculæ seminales*, and bladder are figured by Barkow (90), Tyson (208), and Humphry (142), while in the section given by Cunningham (118) the situation and relationships of the pelvic organs of the male are very well brought out. There has been no good examination of the kidney made, most of the authors already mentioned in this section merely remarking casually upon it.

The Organs of Sense.—The eye of "Mafuca" was examined with some minuteness by Hirschberg (58); Gratiolet (131) and Traill (206) also give some details concerning it. Zuckerkandl (216) has described the turbinate region of the nasal cavities (*see* also references under tongue, p. 12, for the organ of *taste*, and under references 170, 150, and 89, for organs of *touch*).

External Characters, Configuration, and Proportions.—Many contributions to this part of the literature on the chimpanzee have been accompanied by very fine illustrations, such as those with the papers by Beddard (93), Bartlett (91), Nissle (170*a*), Hermes (139*a*),

Hartmann (138*a*), Meyer (58), and Geoffroy St. Hilaire (72); in fact, almost every paper is accompanied by a figure, of greater or less merit, of the animal dealt with by the numerous observers. The hair is black, often mixed with a slight rufous tinge, and tending to become colourless in the vicinity of the openings of the body, where the skin becomes continuous with the mucous membrane. The hair of the face especially, but also of the other parts of the body, although it has always the same arrangement, varies much in length and shade of colour with the sex, the individual, the age, and probably, also, with the variety. Upon the hair, its arrangement and colour, see Bartlett (91), Beddard (93), Bolau (10), Broderip (105), Deniker (121), Du Chaillu (122, 21), Duvernoy (22), Ehlers (23), Embleton (126), Franquet (30), Fick (127), Friedel (129), Geoffroy St. Hilaire (72), Giglioli (31), Gratiolet (131), Hartmann (43, 139), Issel (144), Lenz (53), Martin (159), Meyer (58), Noack (171), Schlegel (193), Traill (206), and Tyson (208). Pigment appears early in life in patches, which gradually fuse together, until all the skin becomes of a slate or melanoid tint. Remarks concerning the deposition and distribution of the pigment may be picked up from most of the writers cited above, especially from Du Chaillu; but very few of them seem to appreciate the fact that it is more a character of age than an indication of species. Its appearance at an early stage of life may turn out to be a character of only one variety. Meijere (163) has shown that the hairs are grouped together in small colonies. The external configuration of the hands and feet has received a great deal of attention: *see* Alix (89), Barkow (90), Duvernoy (22), Dwight (123), Embleton (126), Gratiolet (131), Hepburn (46), Kollmann (150), Nissle (170*a*), Tyson (208), and Meyer (58). Figures of the ear are given by Beddard (93), Barkow (90), Du Chaillu (21), Dwight (123), Hartmann (40), and Schmidt (194). Of the four anthropoids, the chimpanzee retains its ear in its most pristine and fully-developed form, having none of the marks of degeneration that characterise the ear of man, gorilla, orang, and gibbon. It varies very considerably with the individual, and on the sides of the same individual; but it is quite probable that it may turn out to be of value in assisting to characterise sub-species, although it can never be of value for absolute diagnosis. Measurements of the limbs and trunk have been given by the following authors: Ehlers (23), Rollet (186*a*), Meyer (58), Slack (73), Wyman (87*b*), Owen (173), Noack (171), Marshall (158), Lucae (54), Issel (144), Broderip (105), Gratiolet (131), Fick (127), Embleton (126), Dwight (123), and Chapman (111).

Psychology.—With the exception of Darwin (120) and Romanes (187), scarcely anyone has attempted to analyse the mental status of the chimpanzee. Mitchell (164) has also made a contribution to the subject, but most of the other references apply to articles containing merely passing notices of the habits and manners of the chimpanzee in confinement. Du Chaillu's (21) and Reichart's (183) observations,

however, were made in the jungle. Broderip (105), Deniker (121), Eismann (124), Fick (127), Friedel (129), Hartmann (43), Hermes (139*a*), Laborde (152), Martin (159), Nissle (170*a*), and Sayers (192) made their observation upon animals in confinement.

Pathology.—Nothing is known of the diseases to which the chimpanzee is subject in its native surroundings; in Europe it commonly falls a prey to diseases of the respiratory system. *See* Owen (172, 173), Schmidt (195), Rollet (186), and Meyer (58).

Distribution.—The chimpanzee occurs over a much wider area than any of the other anthropoids. Noack (171) and Reichart (183) report specimens occurring in the country along the western shores of Lake Tanganika; Schweinfurth (197) and Emin Pasha (125) found it in Niam Niam, and it has been seen in the region lying between Niam Niam and Tanganika. In fact, its distribution may roughly be said to be the areas drained by the Congo and Niger, and it also occurs along the banks of the smaller rivers on the west coast as far north as lat. 16°, and as far south as lat. 14°. *See* Du Chaillu (21), Franquet (30), Giglioli (31), Hartmann (137, 139), and Issel (144).

Classification.—Mr. Sclater (NATURAL SCIENCE, vol. ix., p. 143, August), has very courteously given his reasons for assigning the generic name of *Anthropopithecus* to the gorilla and chimpanzee. I was aware that Gmelin had given the name and that Fischer had adopted it; also that Flower and Lydekker had accepted it because *Troglodytes* had already been applied to another genus. But there is one very strong reason, it seems to me, why the generic term *Troglodytes* should be retained; it had come to be recognised all the world over as the scientific name of this genus, at any rate, of the chimpanzee. Universality of usage is such a difficult matter to obtain and so absolutely necessary, that it seems to me almost a scientific sin to disturb it once the fixation process has fairly set in. Italian, German, American, French and English anatomists, excepting always those that received their material from the Gardens of the Zoological Society of London, have for the last fifty years used the name *Troglodytes niger* for the ordinary chimpanzee. What I fear most is a state of matters arising in the nomenclature of the anthropoids, such as has already arisen among the names of the macaques, where one cannot with any certainty recognise, from the name, the material with which the author has been dealing. But in ordinary morphological work there is not much danger of any difficulty arising in connection with the nomenclature of a limited group like the anthropoids, because one can always fall back upon the terms gorilla, chimpanzee, orang, and gibbon, names of definite signification for civilised nations.

A great deal of work has been done to show the position of the chimpanzee in relation to the other anthropoids and also its position in descent as regards man. Geoffroy St. Hilaire held the opinion very strongly that the gorilla and chimpanzee should not be included in one genus, but ought to be separated into two well-marked genera,

and this opinion has been accepted in France, while all other countries have followed Savage, Wyman, and Owen, and retained them in one genus. There is no absolute standard of generic value; but this much is certain, that the chimpanzee and gorilla are much more nearly correlated in structure than is either of these to the orang or gibbon, or the gibbon to the orang. (*See* Huxley, 59*a*, 59*b*; Geoffroy St. Hilaire, 72; Broca, 104*a*; Duvernoy, 22; Hartmann, 139, 43; Gray, 133, 134; and Peters, 180.)

There may be well-marked species, sub-species, or varieties of the chimpanzee, but as yet the material at home and notes of habits from the jungle are totally insufficient for their determination. A very considerable literature has sprung up round the chimpanzee of Central Africa, but as already said, our material and information are not enough to afford us any certain grounds for separating the chimpanzee of this region from that of the West Coast. (*See* Giglioli, 31; Issel, 144; Hartmann, 138*a*, 139; Peters, 180; and Noack, 171.)

As regards the number of species or well-marked varieties of chimpanzees on the West Coast of Africa, it is a very hard matter to decide in the present state of our information how far characters that have been assigned as of specific value are really so or are only individual peculiarities. Du Chaillu appears to me to be our safest guide in determining this question, and if he is right, and he can hardly have made a mistake, in saying that the voice and cry of *T. Kooloo-Kamba* is perfectly distinct in character from that of the other forms of chimpanzee, then I do not think he could have adduced any other feature or features so indicative of its being a certain and distinct species. Unfortunately he shot only one specimen, and its external configuration, so far as he describes it, agrees well enough with that of *T. niger*. He found it living also in a country inhabited by another form of chimpanzee, Nshiego-Mbouvé (*T. calvus*). Bartlett (91) and Beddard (93) assigned "Sally" to the latter species. Unfortunately, Du Chaillu on his own statement had rarely seen *T. niger* in his travels, his acquaintance with it being almost restricted to a few young specimens in confinement, and he was therefore unaware of the amount of variation that might occur among the members of that species.

In my last article on the gorilla I made a very stupid blunder, which I now wish to remedy, and confounded the name *Troglodytes tschego* of Duvernoy with *Gorilla gina* of Geoffroy St. Hilaire. *T. tschego* is certainly a name applied to a chimpanzee, but the specific characters assigned by Franquet (30), Slack (73), and Duvernoy (22) are, every one of them, variable. The degree of prognathism, the last molar teeth, the pigmentation of the skin, the colour of hair, the external ear, and proportions of limbs to trunk are subject to considerable fluctuation in different individuals. "Mafuca" (170*a*, 58), *T. aubryi* (130), *T. vellerosus* (132) may or may not be representatives of distinct species; probability is all in favour of their being only peculiarly marked individuals of the more common form.

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IV.

The Organisation of Local Science.

[To judge from enquiries that have been received, so much interest has been aroused among members of our local natural history societies by Mr. Boulger's article on "What shall we do with our Local Societies?" in the last number, that we have much pleasure in furnishing them with the following answer to the questions, which was read by Mr. G. Abbott, General Secretary of the South-Eastern Union of Scientific Societies, before the conference of delegates from local societies, held during the recent meeting of the British Association.—Ed. Nat. Sci.]

MANY begin to recognise, and some, like Professors Meldola and Boulger, have called public attention to, the need of improvement in our local natural history societies—their disappointing result, and too frequent unnecessary decay.

Societies for the cultivation of science, or, as they are more often named, natural history societies, scattered freely over the country have done much good work; some have reached high positions and gained reputations for usefulness, but too many others are weak, irregular, their efforts desultory, and so they fail to take their due position and secure the influence that otherwise might be theirs. Their work too often begins and ends with lectures that are mere stale *résumés* of what others have done; while the real scientific and useful work done by their members, if any, is hid under a bushel.

It is impossible to say accurately how many members are attached to these societies. Professor Meldola estimates them at 24,000. But this, no doubt, is reckoning only those societies which at present send representatives to the British Association. The total number must be at least twice as great, and I think this a low estimate, judging, as I do, by the twenty-five societies which were represented at the Tunbridge Wells Congress of the South-Eastern Union, societies belonging to three counties only. Of these, only four societies are included in the British Association list, viz.: Croydon, Rochester, East Kent, and Holmesdale, and they contain 556 members.

Probably a fair average would be 100 members to each society, and we should thus have in one corner of England alone 21,000 who are not in direct association with the British Association, but who

belong to the City of London, North London, City of London College, Ealing, North Kent, West Kent, Bromley, Sidcup, Maidstone, New Brompton, Horsham, Brighton, Eastbourne, Hastings, Folkestone, Dover, Tunbridge Wells, Southborough, Guildford, Sutton, and Haslemere Natural History Societies.

We must have at least an army of 50,000 members, and from these grand work might be expected. Such a body of men, occupying such an important educational position, should be able to point to better work than any already done. Their immense power might be used to make the study of plants, animals, physical forces still more efficient factors in man's culture and mental development.

Failure to accomplish more than has already been done must be put down to many causes. The present results are, perhaps, not surprising without more direct attempts to guide and develop their latent powers and capabilities. *The chief cause of failure is want of organisation.*

When things are left to chance we must not look for the best results. Should we expect much if our army, navy, and volunteers were left to themselves, to the individual inclinations and humours of the members ?

To effect a genuine advance, improved organisation is urgently needed, and will be eagerly welcomed by those who are anxious to see the "best possible" achieved by these scientific centres.

A step in the right direction has been taken by the Unions of Scientific Societies which already exist in England and Scotland.

Many of you are intimately aware of their advantages, their stability, and pleasant associations.

The Yorkshire and East of Scotland are striking instances of good work resulting from co-operation and energy skilfully used.

The present British Association regulations relating to affiliated societies do not sufficiently foster such unions, and they apply in some cases to conditions and aims which have passed away, or have already been realised. For instance, the publication of Transactions as a condition of affiliation leads now to the unnecessary accumulation of pamphlets, often of small value, when it is already difficult, among such a mass of printing, to find what has previously been written on any particular subject.

The time seems opportune for asking, without being charged with undue haste, whether some alterations might not bring benefits and improvements all round. Is it not time that some step forward should be taken, after a careful survey of past failures and successes ? Time that some plan should be proposed that would tend to organise these scattered units of energy—the local societies—under the guiding care of the British Association ?

Fully believing that further improvement through organisation is possible, I look to the extension of unions of societies in districts under the auspices of the British Association as the most feasible method.

The British Association only can do what is required. It must act as the guiding brain, and, through an organising secretary, help to bring these needed unions into being. The societies must all be brought into touch with it, and not remain, as so many are, unconscious of its aims and work. The societies in many cases are like an army waiting for a leader to guide them further along the pleasant paths of science to fresh fields for work.

The following is the plan I would submit for your consideration:

Districts.—The United Kingdom should be divided into fifteen or twenty districts, in each of which all natural history societies should be affiliated for mutual aid, counsel, and work. Existing unions should perhaps be imitated, at any rate not disturbed.

Geographical lines should decide their size, which might vary in extent and be dependent, in some measure, on railway facilities. From time to time these areas might be subject to review, and necessary changes made.

Congress.—Each of such unions would have its annual congress, attended by delegates and members from its affiliated societies. This would be held in a fresh town every year, with a new president, somewhat after the manner of the British Association itself. The congresses would probably take place in spring, but two should never be held on the same day.

These unions would render important help to local societies, would bring isolated workers together, assist schools, colleges, and technical institutes and museums, start new societies, and revive waning ones. Through these annual meetings local and petty jealousies would lessen or turn to friendly rivalries—each society trying to excel in real work, activity, and good science teaching.

Further, economy of labour would be accomplished by a precise demarcation of area for each local society. This would be understood as its sphere of work and influence; in this portion of country it would have a certain amount of responsibility in such matters as observation, research, and vigilance against encroachments on footpaths, commons, and wayside wastes.

These unions might also, through their Central Committees, bring about desirable improvements in publication, but it would certainly not be desirable, in all cases, to go in for joint publication. In this, as in other matters connected with the unions, *co-operation and not uniformity* must be our aim.

Union Committees.—Each union will need a general secretary and a committee, all of whom should be intimately acquainted with methods of work and the best ambitions of local societies.

Corresponding Members.—This is another necessary development. Each local society should appoint, in every village in its district, a corresponding member with some distinctive title, and certain privileges and advantages.

The work asked of him would be to—

1. Forward surplus Natural History specimens to their Society's Museum.

2. Supply prompt information on the following subjects:—

   (*a*) New geological sections.
   (*b*) Details of wells, borings, springs, etc.
   (*c*) Finds of geological and antiquarian interest.

3. Answer such questions as the British Association or the local society may require.

4. Keep an eye on historic buildings.

5. Assist the Selborne Society in carrying out its objects.

No mean occupation — certainly a useful, attractive, and honourable post—worthy of any man's acceptance.

In return he should be offered—

1. Assistance in naming specimens, and with the formation of school museums.

2. Free admission to lectures and excursions.

3. Copies of transactions.

4. Free use of the societies' library.

Every village would soon, under this scheme, possess an agent, registrar, or whatever you like to call him, who would be more and more able, as he gained experience, to further the aims of this association.

Expenses or Ways and Means.—This cannot be ignored, but would not form a sufficient barrier to prevent the adoption of the scheme.

The unions would be self-supporting, by means of small contributions from the affiliated societies. Money is only wanting for the expenses of *an organising secretary*. I don't attempt to estimate the cost of this, but with objects so desirable and far-reaching in view, the money cannot be considered ill-spent, and the British Association would soon be repaid by obtaining prompt and direct communication with all the towns and villages in Great Britain, by greater assistance in its research work, and in all other branches which the British Association was established sixty-five years ago to promote.

Tunbridge Wells, September, 1896. GEORGE ABBOTT.

SOME NEW BOOKS.

Hertwig *versus* Weismann.

The Biological Problem of To-day. By Dr. Oscar Hertwig; translated by P. Chalmers Mitchell. Crown 8vo. Pp. xix., 148. London: Heinemann, 1896. Price 3s. 6d.

This work will be greeted with satisfaction by all who are interested in the problem of heredity. In translating Professor Hertwig's book, Mr. Chalmers Mitchell has rendered a service to the ordinary reader who may not have the power or inclination to read it in the original. As most people are aware, Hertwig has long been the foremost opponent of Weismannism; indeed, the present work is largely devoted to refuting the doctrine of the Freiburg zoologist. The translator has prefixed a clear and concise statement of the case as it now stands between the two chief schools of thought. He has, however, carefully refrained from giving any opinion of his own. This is, perhaps, a matter for regret. Mr. Mitchell is known as a student and expounder of Weismann's views, and an opinion from him as to the merits of an opponent doctrine would not have been out of place. There is, at the end of the book, a glossary of technical terms which will commend itself to the non-scientific reader.

The book itself is, like all the works of its distinguished author, a model of clearness and simplicity; and the doctrine of epigenesis as opposed to that of evolution is forcibly stated. The opening pages introduce the subject of heredity, and state the position occupied by Weismann. Further on, the fundamental point is dealt with as to whether, in a dividing cell, there is a quantitative or qualitative division of the nucleus; with a decision in favour of the former. That is, each chromosome splits into two exactly equal and like halves, and in no case is there any dissimilarity of structure or properties between them. To prove his case, the author deduces arguments from several groups of facts, especially those dealing with the reproduction of unicellular organisms, and the phenomena of regeneration and heteromorphosis. He next attacks Weismann's doctrine of "Determinants," and points out the logical fallacy in assuming that all the characters present in the adult organisms should necessarily be predetermined in the germ plasm. Such a view results from a failure to distinguish between the causes contained in the egg at the beginning of development, and the causes entering it during the course of development from the taking up of outside material. Thus Hertwig combats the one view of Weismann's that his supporters have found most hard to accept, viz., the almost total indifference of the germ plasm to external surroundings or stimuli.

The latter half of the book gives a plain statement of the author's own views as regards the causes which determine the development of organisms. Quoting from botanists and zoologists, he seeks to show that development is due to external influences acting on a highly complex germ plasm, capable of almost infinite alterations in form

and properties in certain directions. Although, to begin with, each cell has the same nuclear composition, yet the interrelations it holds with its fellows ("centrifugal causes"), and the motive forces due to the action of environment ("centripedal causes"), determine the nature of the cells themselves and the tissues they make up. This idea has been strongly advocated in a later work, "Eine Theorie der Organischen Entwicklung," by Driesch, whose experiments in the mechanics of development led him to similar conclusions. He extends it even further, seeming to hint that all protoplasm is fundamentally the same, and that whether a fertilised egg develops into a man or a medusa is decided by external conditions alone.

Finally, although the importance of the cell as a morphological unit may to some minds be unduly insisted upon, the comparison in the concluding pages between the development of an egg-cell into a man, and of a man into a member of a state, both depending on epigenetic principles, is a suggestive thought, and contrasts favourably with the cumbersome, if ingenious, comparisons and similes resorted to by the author of "the germ plasm."

Taken as a whole, Hertwig's doctrine is easier of understanding and application than Weismann's, but what seems to render it infinitely superior to the latter is its capability of being tested by experiment and observation, towards which object much may be done by such work in the department of experimental research as has recently been published by the author, Roux, Driesch, Chabry, Morgan, and others. A word of praise is due to the translator for having effectively rendered the sense of the original with a minimal departure from the text.

M. D. H.

SNAKES.

CATALOGUE OF THE SNAKES IN THE BRITISH MUSEUM (NATURAL HISTORY). Vol. III. By George Albert Boulenger, F.R.S. Pp. xiv., 727, with 25 plates, and figures in the text. Published by order of the Trustees. London, 1896.

THIS volume contains the Viperidæ, the Amblycephalidæ, and five sub-families of the Colubridæ; the Elapinæ, Hydrophiinæ, Elachistodontinæ, Dipsadomorphinæ, and Homalopsinæ. In bulk it is much the largest of the three, which in part is due to addenda and corrigenda, forty-one pages of which apply to vol. i., and twenty-three to vol. ii. The high degree of merit apparent heretofore is maintained throughout, and the author is to be warmly congratulated for the admirable manner in which he has completed the series. His contribution is certainly one of the best that has appeared on the subject, and is sure to result in great advancement of our knowledge of the order. The classification adopted is a decided improvement on previous attempts. Whether ophidiologists generally accept a scheme placing Hydrophidæ and Elapidæ with the ordinary Colubridæ, or which throws together Crotalidæ and Viperidæ as a single family, will make little difference in the utility of the work. In the midst of so much that is of the best, however, there are points which render it liable to attack, and which will lead to modification in the hands of others, if not in those of the author. Much interference with the names of his genera might have been prevented by rulings somewhat less arbitrary; generic names applied by early writers have been arbitrarily dropped for later ones, and genera have been subdivided out of existence, newer names being given to all the parts. Numerous cases have been ruled out as naked names which are not really such, since with each generic or subgeneric name its author had specified a characteristic

known species and had cited the authority for it. In the publications of Laurenti and of Fitzinger occasions for more than a score of changes may be seen. The rulings also work injustice in the synonymy; because of omissions subsequent authors are credited with discoveries actually made and published by others long before, which can not fail to mislead any one not well versed in the literature. Thus, for instance, *Dasypeltis scaber* and *Pseudechis porphyricus* of Wagler, 1830, are omitted, and credit for the specific assignment of the former is given to Smith (1842) [1849], while the latter is passed along to Günther, 1858. Instances like these are many. The incompleteness of the synonymy will be most productive of fault finding. The literature of anatomy, etc., so useful in other catalogues, is ignored; authors like Nilsson, Malm, Jones, Rochebrune, and Duvernoy, the last presenting fine illustrations of seventeen of the species, receive no attention; and among scattered references ignored are species such as *Crotalus cumanensis*, *Crotalus lœflingii*, *Platurus vulcanicus*, *Pituophis heermani*, *Alsophis fuscicauda*, *Dipsas dieperinkii*, *Coluber* (*Natrix*) *subcarinata*, *Boa ambleocephala*, and *Dendrophis aurata*. Criticism will be provoked also, to become more accented in future research, by a tendency to extend the limits of species and of varieties too far, and thus to bury and lose in the synonymy too much of what is known. The case of *Crotalus confluentus*, a rattlesnake common west of the Mississippi river, is an illustration: the synonyms given for this species include ? *viridis*, *oregonus*, *lucifer*, *lecontei*, *atrox*, *sonorensis*, *durissus* (Wied.), *exsul*, and *ruber*, and the author remarks "This species may be divided into two principal varieties, which are not definable by any structural characters that I know of, viz.: the typical form, with a dark temporal band extending to the commissure of the mouth; and the Texan *C. atrox*, in which a dark band descends obliquely from the eye to the mouth far in advance of the commissure." *C. atrox* and *C. exsul*, however, represent a group distinguished from *C. confluentus* by the presence of but two scales in contact with the rostral between the nasals and by the band from the eye in front of the commissure, a group of varieties having closer affinities with *C. durissus*, Linn. (*C. adamanteus*, Beauv.), of which species *C. atrox* is the southwestern representative. *C. exsul* is a dwarf, individuals bearing a dozen rings or more in the rattle being hardly larger than the young *C. atrox* before acquiring its first ring. *C. confluentus*, of several varieties, is distinguished from *C. atrox* and its closer allies by the presence of three or more scales in contact with the top of the rostral between the nasals and by the band from the eye to or behind the commissure. Without space for further comment, we may add that the points criticised seem the more prominent because of the general excellence of the work in which they appear.

A JENNER CELEBRATION.

WHAT IT COSTS TO BE VACCINATED: The Pains and Penalties of an Unjust Law. By Joseph Collinson. Pp. 46. London: William Reeves, 1896.

THIS nicely got up little work is published for the Humanitarian League; it is excellently printed on good paper, and is singularly free from printers' errors. There is a short preface by a Mr. Ernest Bell, who candidly admits that the subject of vaccination is not one of which he can pretend to any knowledge, but who is nevertheless able to adduce two capital arguments against the practice: the first is the unanimity of the medical profession in its favour, and the second the "eager advocacy of the *British Medical Journal*."

We do not gather from a perusal of Mr. Collinson's pamphlet that he possesses any pathological knowledge, statistical ability, logical faculty, or other special qualification for the discussion of the subject. It is indeed a very typical instance of the ordinary anti-vaccinationist propaganda, and it is a curious thing that the writers of this kind of literature spend their strength in the vain endeavour to discredit the value of the practice they are attacking, instead of basing their argument on the liberty of the subject to run any particular risk he may choose. This liberty, as opposed to the right of the State to prevent his being at the same time a risk to the community, affords a legitimate subject for discussion, and involves a pretty ethical question. But of such argument there is little trace in Mr. Collinson's pamphlet, which consists mainly of hysterical invective and well-worn exaggerations, with the usual highly-coloured illustrative cases. This journal is not the place for the discussion of the merits of vaccination, nor indeed is there any immediate need to discuss the matter in view of the recent publication of the Report of the Vaccination Commission, and while the lesson of Gloucester is still fresh in the public mind. We can only deplore the perversion of mind which leads to the production of a work of this character, and the credulity and ignorance upon which it is only too likely to impose.

The Honey Bee.

The Honey Bee: a Manual of Instruction in Apiculture. By Frank Benton. Pp. 118, xi. pls., 76 woodcuts. Bulletin No. I.—New Series (Revised Edition). United States Department of Agriculture. Washington: Government Printing Office, 1896.

The publication of such works as the present treatise by a Government Department is deserving of high praise, and the practice might with advantage be imitated by our own Board of Agriculture. The work includes a most detailed and copiously illustrated account of the anatomy, economy, races, manipulation, and entire treatment of the honey bee, together with all the appliances incidental to apiculture. The directions and advice are given in plain language, such that the veriest tyro can with but a small amount of study and labour make himself fairly successful in the art. It would be out of place here to follow the author through the minutiæ of this interesting and commercially valuable pursuit. We wish, however, to call the attention of agriculturists, and particularly of the fruit growers, to the importance here insisted on of combining bee-keeping with fruit-farming. The presence of an apiary in the midst of the orchard entails a comparatively small additional cost, and cannot fail to largely increase the number of fertilised blossoms, and thus the value and weight of the resulting crop; at the same time, the fertilising agents pay their own way by the return of wax and honey.

Our own Board of Agriculture might do worse than circulate the kind of information given by Mr. Benton. County Councils have already done good work in providing lecturers and demonstrations by means of travelling bee-vans to many rural districts. We doubt, however, if it has been sufficiently brought home to the minds of the English country-people that the annual yield of fruit bears a very direct relation to the abundance of insects, and particularly of bees during the season of blossom. The reader of the book now under notice will gain much useful information on the subject, and also on the plants which may be profitably grown in this connection at other seasons of the year. The book itself is well printed, and the majority

of the illustrations are clear and of practical value. There is a short list of the leading books and journals relating to apiculture, and to many of these, especially to Cheshire's well-known work, the author acknowledges his indebtedness. O. H. L.

The Shade-Tree Insect Problem. By L. O. Howard. Pp 24. From Year Book of the United States Department of Agriculture. Washington, 1896.

A short but most excellently illustrated pamphlet on the "Shade-Tree Insects" of the eastern United States, by Mr. L. O. Howard, contains descriptions of the insects which have been found most injurious to trees in the streets, parks, and gardens of certain American cities. These are three native moths—a psychid (*Thyridopteryx ephemæriformis*), a tussock (*Orgyia leucostigma*), and an "ermine" (*Hyphantria cunea*) and an imported European beetle (*Galerucella luteola*). After pointing out the various remedies to be applied, the writer suggests that, where the city authorities are slow to move in attacking the insect devastators, the citizens should form a tree-protection league, and each inhabitant undertake to clear the insects from the trees in front of his own residence.

Some Serials.

In the *Boletim de la Sociedad Geographia de Lima* for the concluding period of 1895, just to hand, the valuable "Contributions to the Study of the Flora of the Peruvian Corvillices," by John Ball, deals with the composites, asclepias, gentians, heliotropes, etc. Manuel Garcia y Merino publishes a paper on the common names of Peruvian plants, which should be of much value to travellers. The other portions of the *Boletim* are taken up by geographical papers and an important discussion on the languages of the central Andean region by Dr. Leonardo Villar. The Aymara, Cauqui, Yunca, and Puquina dialects are dealt with, and the paper concludes with an examination into the antiquity of the Keshna, and the question whether this may be a primitive language, as Dr. Villar supposes.

We have often occasion to refer to the *Photogram*, that bright monthly published by Dawbarn & Ward. The issue for September is more than usually attractive, as it contains an appreciation of Mr. Hay Cameron, with specimens of his work, and a paper on photography in natural colours, in which Mr. Anderson, of Albany, N.Y., claims to be the original inventor and improver of the method we described in August (Natural Science, vol. ix., p. 87). The *pièce de résistance*, however, is the article "Beauty Spots of London," illustrated by charming and artistic views of St. Paul's, the Thames Embankment, the Bluecoat School, the Thames at Lambeth, Epping Forest, and others, especially a still moonlight scene "Westminster by Night."

The *Scottish Geographical Magazine* for August contains a valuable article on the Island of Formosa, by the Rev. W. Campbell, of Tainanfu, with a map on a scale of about twenty miles to the inch.

The *Westminster Review* occasionally contains articles which come within our province. In the August number there is such a one, by Walter Nathan, on the influence of the Stomach upon the Mind. The writer sensibly remarks that he would place no restrictions, beyond keeping to the one essential, that of taking food in such quantities and at such times as will best maintain mental and bodily capacity. He advocates a substantial breakfast, a very light lunch,

just a "snack" in fact, and a good dinner, eaten leisurely, but always of fresh meat, *rechauffés* being simply "poison."

The *Nineteenth Century* for August quotes some interesting reminiscences of Huxley by Mr. Wilfred Ward, a neighbour and friend.

Knowledge for September contains, besides much interesting matter, a fine full-page reproduction of a photograph of sooty albatrosses taken on Laysan Island, by Mr. Palmer, the collector for the Hon. Walter Rothschild.

The *Literary Digest* for August 22 contains a translation from *La Nature* of an article on the decimal division of time, with figures of watch-dials divided in this way. The writer is hopeful that this reform may be introduced, and quotes a resolution passed by the London Geographical Society in 1896 inviting similar societies to study the application of the metric system to the measurement of time.

The *Irish Naturalist* for September is devoted to a description of the fauna and flora of Clonbrock, Co. Galway, which was investigated by a party of the Dublin Naturalists' Field Club last June. The results are very gratifying, and have been worked out as follows:—Land Planarians and Leeches, Land and Freshwater Mollusca, and Isopods, by R. F. Scharff; Earthworms, by Rev. H. Friend; Spiders, by G. H. Carpenter; Hemiptera and Coleoptera, by J. N. Halbert; Fungi, by E. J. McWeeney; Mosses and Hepatics, by David M'Ardle; and Flowering Plants and Vascular Cryptograms, by R. Lloyd Praeger.

We have received from the British Association the handy little guide to Liverpool and the neighbourhood, edited by Professor W. A. Herdman, who himself contributes an article on the marine fauna of the district. The archæology, geology, zoology, entomology, and botany are treated respectively by W. H. Picton, G. H. Morton, H. O. Forbes, W. E. Sharp, and Robert Brown. Instructive information is also given as to the tides, the climate, the trade, industries, etc., of Liverpool; and there are five maps, among which we may specially notice the biological chart of the Irish Sea, which forms quite a new departure.

It is announced that Cuvier's work, dated 1788, on the edible crabs of the French coast, as well as a number of his letters, are about to be published by the Leopoldinisch-Carolinische Akademie of Halle.

Literature Received.

Theory of National and International Bibliography, F. Campbell: Library Bureau. Revision of North American Slugs, H. E. Pilsbry and E. G. Vanatta; Synopsis of the Polar Hares of North America, S. N. Rhoads: *Proc. Ac. Nat. Sci. Philadelphia.* Some Plants worth Cultivating, J. H. Maiden: *Agric. Gazette N.S.W.* Presidential Address, H. D. Geldart; Contributions to the Flora of Russian Lapland; Contributions to the Flora of Kolguev, H. D. Geldart and H. W. Fielden: *Trans. Norfolk and Norwich Nat. Soc.* On the So-called Supra-Renal Bodies in Cyclostoma, W. E. Collinge and S. Vincent: *Anat. Anzeiger.* Geological Structure of the Extra-Australian Artesian Basins, A. G. Maitland: *Proc. Roy. Soc. Queensland.* Royal Natural History, pts. 33 and 34, R. Lydekker: Warne. History of Mankind, pts. 9 and 10, F. Rätzel: Macmillan.

Nature, August 20, 27, September 3, 10. Literary Digest, August 15, 22, 29, September 5. Revue scientifique, August 22, 29, September 5, 12 Irish Naturalist, September. Feuille des jeunes Naturalistes, September. Amer. Journ. Sci., September. Naturæ Novitates, August (15 and 16). Victorian Naturalist, June, July. Science, August 14, 21, 28, September 4. Scott. Geogr. Mag., September. Science Gossip, September. The Naturalist, September. Westminster Review, September. Amer. Geologist, August, September. Botanical Gazette, July, August. Review of Reviews, September. Pop. Science News, September. Knowledge, September. Photogram, September. Psychological Review, September. Journal Marine Biol. Assoc., August.

OBITUARY.

ALEXANDER HENRY GREEN.

BORN 1832. DIED AUGUST 19, 1896.

THE late Professor of Geology at Oxford was born in 1832, and was educated at Ashby de la Zouche Grammar School. He entered Gonville and Caius College, Cambridge, became Sixth Wrangler in 1855, and was elected a Fellow of his college the same year. He was appointed to the Geological Survey of England and Wales in 1861, and in 1875 was elected Professor of Geology at Yorkshire College. On the retirement of Professor Sir Joseph Prestwich from Oxford in 1888, Professor Green was chosen as his successor. He was an M.A. of Christ Church, Oxford, having been incorporated from Cambridge. His chief work while on the Geological Survey was done in the districts of Banbury, Woodstock, Bicester, Buckingham, Leeds, Tadcaster, and the Yorkshire Coalfield, Stockport, Macclesfield, Congleton, and Leek, but his best known and most enduring work is his "Geology for Students: Part I., Physical Geology." When Professor Green came to Oxford he found that geology had only just been made a subject of examination in the schools, and that no adequate provision for its teaching existed. He at once set to work to start a proper geological laboratory, and among the improvements which he initiated was that of acquiring the services of each successive Burdett-Coutts scholar during the first year of his scholarship, a move which was a mutual benefit to the museum and to the scholar. Either the atmosphere of Oxford or the weight of a large but ill-arranged collection seemed to act as a check on his original investigations, and since his appointment to the professorship at that University science has owed but little to his researches, though as a mining expert he was much sought after. He succumbed to the effects of paralysis, and was buried at Wolvercote.

GEORGIANA ELIZABETH ORMEROD.

BORN JULY 23, 1823. DIED AUGUST 19, 1896.

THE elder sister and constant companion of Miss Eleanor A. Ormerod passed away at St. Albans, aged 73 years. Miss Ormerod was born in London, and early showed a bent towards botany and conchology; her collection of shells, containing upwards of 3,000 species, was given by her to the Huddersfield Museum. For many years she assisted her sister Eleanor in her work on economic entomology, her linguistic gifts being of invaluable assistance, while her skill with the pencil and brush have been practically applied in drawing a

large number of entomological charts, for agricultural or other economic purposes. A short time before her death Miss Ormerod was elected an honorary member of the Bath and West of England Society for her services to agriculture. Her energy and perseverance were remarkable, and her sister writes that she mastered a language at the age of sixty in order to advance her entomological studies.

Apart from her scientific work, Miss Ormerod took great interest in the distribution of serviceable and healthy literature to the poorer classes, and rejoiced in furthering many benevolent and charitable objects. It is difficult to estimate the loss that has fallen on Miss Eleanor Ormerod in the death of this talented and devoted helpmate.

We regret to record the death of Maurice Versupuy, who had only just returned to France after his daring and rapid march across Africa, from Mombasa to the Congo. He left Mombasa in the summer of 1895, and marched along the Uganda road to Fort Smith in the Kikuyu country. Thence he proposed to visit Kenya, but although his caravan was powerful he was unable to overcome the opposition of the natives and reach that mountain, either through Kikuyu or across Laikipia. He had a hard fight with the Masai south of Lake Naivasha, during which Dick of Mombasa was slain. Versupuy had another conflict with natives further west, but reached the Congo in safety. He returned to Chantilly, where he died of fever a few days later.

Dr. J. M. Toner, of Washington, died on July 30, aged 71. He founded the Toner lectures, and in 1882 gave his magnificent library of 28,000 books and 18,000 pamphlets to the Congressional Library. He was also a writer and researcher on medical science.

We have also to record the deaths of:—Samuel H. Parkes, the astronomer, whose early writings on entomology are well known; Mr. Carrière, of the Jardin des Plantes in Paris, author of many works on plant variation, on August 18, aged 79; Luigi Palmieri, Director of the Vesuvius Observatory, aged 89; Professor Egli, editor of the "Nomina Geographica," and a well-known geographer, aged 73; Professor K. Günther, anatomist, aged 74, in Wynne, on July 13; the well-known geologist and Alpine explorer, Dr. F. Simony, in St. Galle, on July 20, aged 83; the dipterologist, W. Tief, Professor in Villach, Carinthia; Joseph Dwight Whitney, Professor of Geology and Metallurgy at Harvard University, on August 19, aged 76; Albert N. Prentiss, for twenty-eight years Professor of Botany and Horticulture at Cornell University, at Ithaca, on August 14; F. A. A. Skuse, entomologist at the Australian Museum, who had lately been working at Australasian Diptera; and George Brown Goode, Assistant-Secretary of the Smithsonian Institution, on September 6.

NEWS OF UNIVERSITIES, MUSEUMS, AND SOCIETIES.

We note among recent appointments:—G. F. Stout, of St. John's College, Cambridge, to be Anderson Lecturer on Comparative Psychology at Aberdeen; Professor W. Dames, to succeed the late Professor Beyrich in the Chair of Geology and Palæontology at Berlin, and to have charge of the geological and palæontological collections in the Museum für Naturkunde; Dr. Wilhelm Sandmeyer, to be Professor of Physiology in Marburg University; Dr. Benecke, to be Docent in Botany in Strasburg University; Professor F. Hofmeister, of Prague, to the Chair of Physiological Chemistry at Strasburg; Dr. J. E. Weiss, of Munich, to be Professor of Botany and Zoology in Freising; Dr. Staudenmaier, of Munich, to be Professor of Chemistry and Mineralogy in Freising; Dr. B. Hofer, of Munich University, to be Professor of Fish-Anatomy and Fish-Diseases at the Veterinary School in that town; Dr. F. W. K. Müller, of the Ethnological Museum in Berlin, to be Directorial Assistant; A. Zimmermann, Professor of Botany in Berlin University, to the Botanical Garden in Buitenzorg, Java; F. S. Earle, to be Professor of Biology at the Alabama Polytechnic Institute; B. M. Duggar, to be Assistant in Cryptogamic Botany in Cornell University; Dr. Colin A. Scott, to be Professor of Experimental Psychology at the Chicago Normal School; Dr. Bashford Dean, to be Adjunct-Professor of Zoology at Columbia College.

Mr. E. Gerrard, who for fifty-five years and a half has been an Attendant in the Zoological Department of the British Museum, and who for ten years before that was connected with the then Museum of the Zoological Society of London, quits the service of the Trustees at the end of September. Mr. Gerrard has been for many years a veritable encyclopædia of information as regards the history of specimens in the British Museum, and his loss will be keenly felt. In 1862 he contributed a catalogue of the bones of Mammalia in the Museum. We understand that he will still take an active interest in zoology in connection with his son, and we hope he will enjoy the best of health in his well-earned retirement.

The entomologist, G. A. Baer, of Paris, has gone to Peru to investigate the insect fauna.

Dorpat University and the Russian Geographical Society have requested Dr. N. Busch to undertake a botanical investigation of the Caucasus.

We deeply regret to learn, as we do from the *Daily Telegraph*, that in the great cyclone which passed over Paris on Thursday, September 10, damage to the extent of £3,000 was done at the Musée d'histoire naturelle. Not only did water enter the laboratory and damage many of the specimens there exposed, but several lithographic stones prepared for the illustration of forthcoming memoirs were irretrievably spoilt.

An attempt is being made by the inhabitants of Londonderry to found a museum. We learn from a correspondent, however, that the object is chiefly to get together a collection of relics illustrating the history of the town, though a pro-

vision for natural history objects might be made later. But as the present Town Council refuses to take any action, the matter is in abeyance till November, when it may be brought before the Council then to be elected.

Marshall Field, the founder of the Field Columbian Museum, has promised $2,000,000 to that institution in the event of the city agreeing to remove it from Jackson Park to the new Lake Front Park.

Among the specimens added to the Museum of the Royal College of Surgeons during the past year are the following:—The dissected legs and feet of a case of congenital absence of the tibia in man, presented by H. H. Chilton; four groups of the barnacle, *Lepas fascicularis*, which forms for itself a float of cement bubbles around the minute floating body to which the stalk is at the outset attached, presented by Professor C. Stewart; a skeleton and dissections of various organs of *Lepidosiren paradoxa*; various organs of the chimpanzee, presented by J. Marshall; three specimens of *Myxine glutinosa*, showing that the protandrous hermaphrodite condition of the reproductive organs; skeletons and organs of *Epomophorus*; and organs of *Tapirus americanus*.

A Natural History Society for the people has been established in Berlin, chiefly to provide lectures of a non-technical character. The first of the series, by Professor Förster, was on "Conditions and Beginnings of Life on the Earth."

The scientific laboratories of the Imperial Institute have been enriched from two sources: firstly, the Goldsmiths' Company have given £1,000 for extension and equipment, and secondly, a Fellowship of £150 annually for the investigation of natural products has been established by the Salters' Company.

On October 8 there will be opened at St. Andrews a new building for the Marine Biological Laboratory, containing a large tank-room and a workroom capable of seating six researchers. It will be known as the Gatty Laboratory, after the donor, Dr. C. H. Gatty.

At the opening of the winter session at Charing Cross Medical School, the first Huxley lecture, on "Recent Advances in Science, and their bearing on Medicine and Surgery," will be delivered by Professor Michael Foster.

The Antarctic expedition, headed by Mr. de Gerlache, has found its preparations too numerous, and has therefore put off its departure till next year, when it will start probably equipped the better for the delay. There have been rumours that Nansen has expressed a wish to join this expedition, and it is stated that if he will consent to be its leader, the Belgian Government will make itself immediately responsible for all the cost.

We learn from the *Daily Chronicle* that Dr. Paul Topinard, the eminent French anthropologist, accompanied by Dr. Beddoe, a past president of the Anthropological Institute, is about to make a tour of observation through Wales for the purpose of obtaining statistics with reference to the inhabitants of the remoter districts of the principality, which Dr. Topinard believes will point to an identity of origin of the Welsh and Breton races.

CORRESPONDENCE.

The Dating of Books.

With reference to this subject, so often referred to in your columns, allow me to bring to your notice "Memoranda of Books registered in the 'Catalogue of Books printed in the Straits Settlements,' under the provisions of Ordinance No. xv. of 1886, during the quarter ending June 30, 1896." This is a sheet published by the Registering Officer, under the direction of the Colonial Secretary for the Straits Settlements, and gives the following items relative to each publication :—(1) Title of Book; (2) Language in which the Book is written; (3) Name of Author, Translator, or Editor of the Book; (4) Subject; (5) Place of Printing; (6) Place of Publication; (7) Name of Firm of Printer; (8) Name of Firm of Publisher; (9) *Date of Issue from the Press;* (10) *Date of Publication;* (11) Number of Sheets, Leaves, or Pages; (12) Size; (13) Number of the Edition; (14) Number of copies of which the Edition consists; (15) Price at which the Book is sold to the Public; (16) Name and Residence of the Proprietor of the Copyright. The italics are mine.

Here we have at once every item of interest or importance connected with a book, certified by the authorities, and registered at a central bureau. I have received this exceedingly important publication, by the kindness of the Colonial Secretary, for some years, and have found it invaluable in verifying references to the literature of Singapore. It is curious that we have to go to one of our smallest colonies, and one yet in its infancy as regards printing and publishing, in order to find such information registered—information which, in older countries, is most difficult to obtain, from want of a system which prevents the false dates often placed upon books by authors and by publishers, and provides a record of value to every person concerned in a publication.

C. Davies Sherborn.

NOTICE.

To Contributors.—*All communications to be addressed to the* Editor *of* Natural Science, *at* 22 St. Andrew Street, Holborn Circus, London, E.C. *Correspondence and notes intended for any particular month should be sent in not later than the* 10*th of the preceding month.*

To the Trade.—Natural Science *is published on the* 25*th of each month; all advertisements should be in the Publishers' hands not later than the* 20*th.*

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